NOV 17 1947

FACTORY

MANAGEMENT AND MAINTENANCE

NOVEMBER 1947

SPECIAL REPORTS

Why Ford Workers Voted Down the Pension Plan 66
What the Factory Worker Really Thinks About the Taft-Hartley Law—and Labor in Politics 90

EDITORIALS

Taft-Hartley Act Frees "Slave" Labor preceding 65
Management Has the Same Chance That Labor Mulled 65

PRODUCTION

How One Company Solved Its Bar Stock Storage Problem 71
On-the-Line Training With Job Instruction Sheets 72
Mail Goes Faster, at Lower Cost, by Pneumatic Tube 89
Plantwide Cost Reduction Raised Output 50 Per Cent 98
Low-Cost Inventories Through Close Controls 102
Trolley Conveyors — *Plant Operation Library No. 108* 105
Fork Trucks Double Storage Capacity, Halve Man-Hours 129

MAINTENANCE

The Beautiful Plant Is More Efficient 76
What Sizes of AC Motors for Pulsating Loads 80
How to Maintain Spotwelders 84
Snow Removal by Steam Heat 97
Ten-Step Upkeep in a Non-Stop Plant 120
Stand-By Equipment Pinch Hits When Services Fail 124
Safety Rules for Maintenance Men 132

INDUSTRIAL RELATIONS

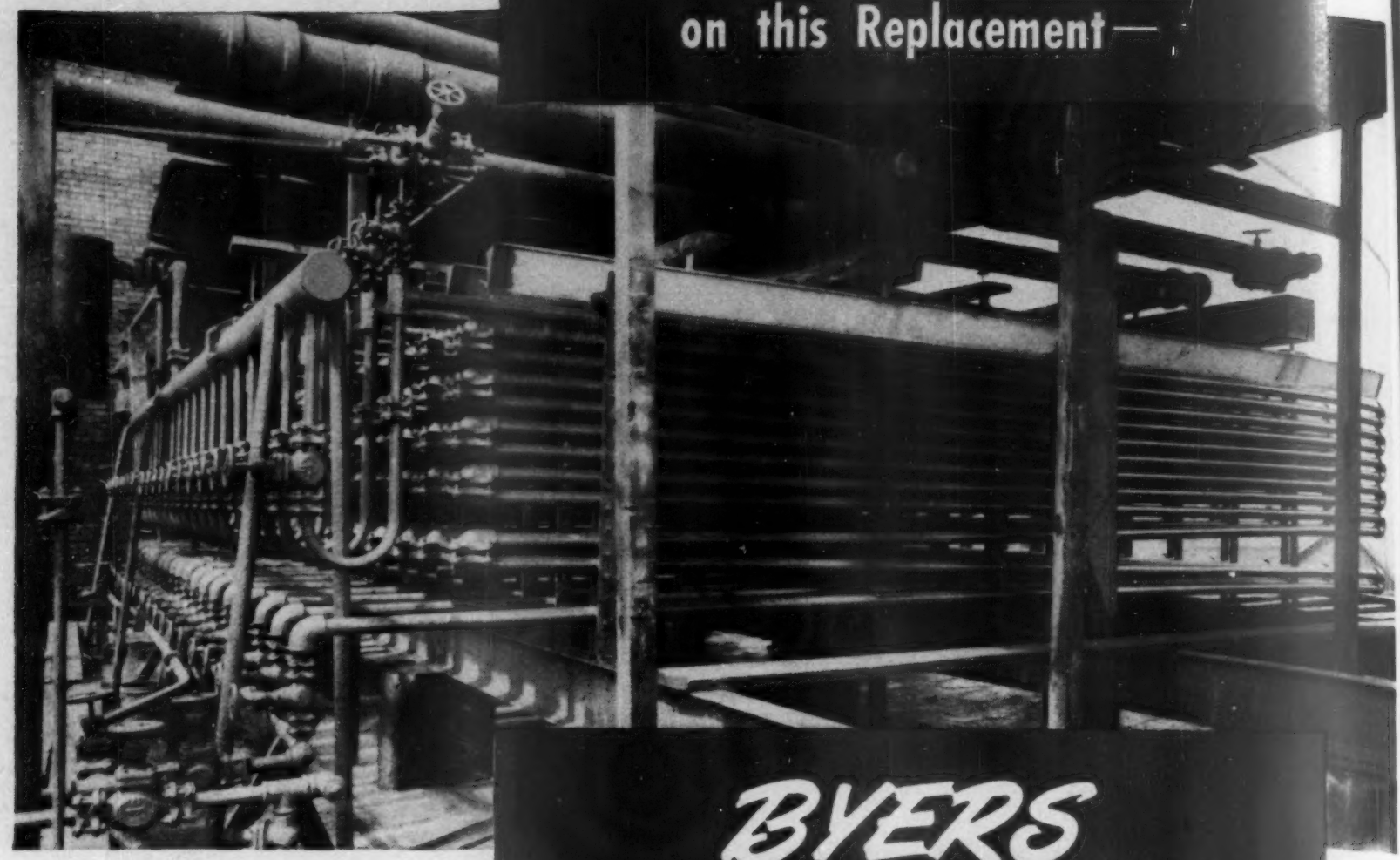
New Wage Plan Guarantees Share of Production 74
Report to Employees Ties Wages to Profits 83
Four-Hour Induction School Gives Job Picture to New Workers 117
Tailored Tests to Match Men and Jobs 126

DEPARTMENTS

Looking Ahead in Labor, 128 • Looking Ahead in Business, 129 • Operating Shorts, 130 • What's New in Equipment, 138 • You Want to Know, 204 • Significant Labor Developments, 216 • They Say and Do, 236 • Behind the Bylines, 252 • Books and Booklets, 262 • On the Calendar, 270 • Catalog Service, 274

A McGRAW-HILL PUBLICATION

Service Records Dictated "Specs" on this Replacement—



BYERS
WROUGHT IRON PIPE

When this condenser was rebuilt, there were no debates or delays in the matter of material selection. The old condenser, built of genuine wrought iron, had given more than 20 years of trouble-free service, and this splendid record dictated the new specifications. Byers Wrought Iron pipe was installed.

If you are using low-first-cost materials in your condensers, preheaters, economizers, or other heat exchanger equipment around your plant, and are bothered by frequent repairs, you may find a source of substantial savings by using wrought iron. This material has been favored for such applications for decades, and users have reported some remarkable service records. In many instances, other piping or tubing materials had also been used, giving a direct comparison service under identical conditions, and wrought iron was usually reported as lasting two to three times as long.

You'll find the reason for wrought iron's superior durability in its unique structure and composition. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack. The fibers also help anchor the initial scale, which shields the underlying metal.

Our bulletin, "Wrought Iron in Refrigeration and Air Conditioning Systems," will give you some helpful information. Ask for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

FACTORY

MANAGEMENT and MAINTENANCE

NOVEMBER, 1947

ALFRED M. STAEHLE, Publisher

L. C. MORROW, Editor

LEWIS K. URQUHART, Managing Editor

Field Editors
G. A. VAN BRUNT, CARL G. WYDER, New York; WILLIAM S. WHEELER, Chicago; CHARLES R. SCHUBERT, Cleveland

Assistant Editors
KATHLEEN NORTH, CARROLL W. BOYCE, MILDRED GALE, KAY WHITE

Layout Editor
GEORGE L. SMITH

Consulting Editors
A. H. MOGENSEN, H. P. DUTTON, CHARLES B. GORDY, WHITING WILLIAMS

Washington Bureau
DONALD D. HOGATE, Director
J. M. GAMBATESE, Labor

McGraw-Hill Department of Economics
DEXTER M. KEEZER, Director

McGraw-Hill World News
JOHN F. CHAPMAN, Editorial Director

McGraw-Hill Research
JOHN C. SPURR, Director

H. E. HILTY, Sales Manager

McGRAW-HILL PUBLISHING CO., INC.

James H. McGraw; Founder and Honorary Chairman.

JAMES H. McGRAW, JR., President; CURTIS W. McGRAW, Senior Vice-President and Treasurer; JOSEPH A. GERARDI, Secretary; NELSON BOND, Director of Advertising; EUGENE DUFFIELD, Editorial Assistant to the President; J. E. BLACKBURN, Jr., Director of Circulation.

Factory Management and Maintenance, November, 1947, Vol. 105, No. 11. Published monthly, McGraw-Hill Publishing Co., Inc., 1100 West Broadway, Louisville, Ky. Entered as second-class matter at Louisville, Ky., October 11, 1946, under the Act of March 3, 1879. Address all communications to the editorial, executive and circulation offices, 330 West 42nd Street, New York 18, N. Y.

Factory Management and Maintenance is a consolidation of Factory and Industrial Management (including "Factory") and Maintenance Engineering. Price 35c a copy. Subscription rates—United States, U. S. Possessions: $3, 1 year; $4, 2 years; $5, 3 years. Canada: $4, 1 year; $6, 2 years; $8, 3 years. Pan-American countries: $6, 1 year; $10, 2 years; $12, 3 years. Other countries: $15, 1 year; $25, 2 years; $30, 3 years. Factory Management and Maintenance solicits subscriptions only from production, maintenance, and management executives and engineers in manufacturing plants. Please indicate company connection and title on all subscription orders. Cable address, "McGraw-Hill, New York." Member A.B.P., Member A.B.C.

Copyright 1947 by McGraw-Hill Publishing Co., Inc. All rights reserved.

District Managers: G. E. Pomeroy, Boston; L. E. Crist, R. P. Rose, Chicago; R. C. Greiner, Cleveland; T. W. Van Winkle, Detroit; J. S. Cawley, Ralph T. Soule, New York; E. Macaulay, Philadelphia; R. W. Garrison, Pittsburgh; W. R. Pankow, St. Louis. Other offices at Atlanta, Los Angeles, San Francisco, Washington, and London.

World News offices: London, Paris, Berlin, Moscow, Prague, Shanghai, Bombay, Mexico City.

production • maintenance • labor management

TAFT-HARTLEY ACT FREES "SLAVE" LABOR	*preceding page*	65
MANAGEMENT HAS THE SAME CHANCE THAT LABOR MUFFED		65
WHY FORD WORKERS VOTED DOWN THE PENSION PLAN		66
HOW ONE COMPANY SOLVED ITS BAR STOCK STORAGE PROBLEM		71
ON-THE-LINE TRAINING WITH JOB INSTRUCTION SHEETS		72
NEW WAGE PLAN GUARANTEES SHARE OF PRODUCTION		74
THE BEAUTIFUL PLANT IS MORE EFFICIENT		76
WHAT SIZES OF AC MOTORS FOR PULSATING LOADS		80
REPORT TO EMPLOYEES TIES WAGES TO PROFITS		83
HOW TO MAINTAIN SPOTWELDERS		84
MAIL GOES FASTER, AT LOWER COST, BY PNEUMATIC TUBE		89
WHAT THE FACTORY WORKER REALLY THINKS I. ABOUT THE TAFT-HARTLEY LAW, AND LABOR IN POLITICS		90
SNOW REMOVAL BY STEAM HEAT		97
PLANTWIDE COST REDUCTION RAISED OUTPUT 50 PER CENT		98
LOW-COST INVENTORIES THROUGH CLOSE CONTROLS		102
TROLLEY CONVEYORS — *Plant Operation Library No. 108*		105
FOUR-HOUR INDUCTION SCHOOL GIVES JOB PICTURE TO NEW WORKERS		117
TEN-STEP UPKEEP IN A NON-STOP PLANT		120
STAND-BY EQUIPMENT PINCH HITS WHEN SERVICES FAIL		124
TAILORED TESTS TO MATCH MEN AND JOBS		126
LOOKING AHEAD IN LABOR	*following page*	128
LOOKING AHEAD IN BUSINESS	*preceding page*	129
FORK TRUCKS DOUBLE STORAGE CAPACITY, HALVE HAN-HOURS		129

departments

OPERATING SHORTS *(outstanding methods briefly reported)*	130
SAFETY RULES FOR MAINTENANCE MEN *(maintenance data sheets)*	133
WHAT'S NEW IN EQUIPMENT	138
YOU WANT TO KNOW	204
SIGNIFICANT LABOR DEVELOPMENTS	216
THEY SAY AND DO	236
BEHIND THE BYLINE *(facts about* FACTORY'S *authors)*	252
BOOKS AND BOOKLETS	262
ON THE CALENDAR *(national meetings for plant operating men)*	270
CATALOG SERVICE *(announcements of manufacturers' literature)*	274

UNIQUE APPLICATION OF POWER BRUSHING CUTS CLUTCH CLEANING COST 50%

HERE at Monmouth Products Company, Cleveland, Ohio, automotive parts manufacturer, you see an example of how brushes and a little brain work can produce handsome dollar savings daily. The job of cleaning dirt and excess oil and grease from clutch plates had previously been done manually. It took four girls and mountainous quantities of rags to process about 3000 plates a day.

Then Osborn and Monmouth engineers joined forces to develop this automatic brushing machine. It consists of a synchronized turntable, geared to keep pace with the punch press output. On the turntable are six loading stations in the form of spindles. As the turntable revolves, each clutch plate passes between two sets of Osborn Monarch tampico brushes. The result is a perfect cleaning job with just enough grease remaining to serve as a protective coating. Only two girls are required to remove and inspect the plates and production has been increased to 3100 daily.

Costs halved and production increased! Would you like to share in such savings? An Osborn sales engineer will be glad to check your operations for possible profitable applications of power brushes. The next move is yours—just write . . .

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

TAFT-HARTLEY ACT

Frees "Slave" Labor

THE TAFT-HARTLEY ACT is two months old. Its full meaning is yet to be determined by decisions of the National Labor Relations Board and the courts. However, on its face, the Act refutes the attacks made upon it by union leaders as hysterical and fanciful.

Management has had every provocation to reply to these attacks in kind. To the credit of the employers of this country, they have not succumbed to that temptation. They have maintained a temperate attitude toward the new law and the problems it is designed to correct. This approach is right. But it is only an approach.

Union leaders will want to settle for nothing short of *repeal.* Their attack on the Act has made some headway. It may be more effective as time goes on. *Certainly the Taft-Hartley law will be repealed if management just sits tight and lets union leaders continue to confuse their followers.*

Management, therefore, must implement its present temperate attitude with a program of positive action. The Taft-Hartley Act must be made to work not because management wants it, but because it is fair to labor—and management can do things right now to see that the Act works. Management can:

I. Utilize every means at its disposal to acquaint the rank and file of union workers with the truth about the Taft-Hartley Act.

II. Suggest amendments to the Act if experience indicates that amendments are necessary.

III. Use the law as little as possible in settling labor disputes.

IV. Stand firm in its refusal to bargain away the rights accorded by the Act to workers, management, and the public.

An examination of those four *must's* will show why they provide management with its best program of action.

I.

Union members do not know what the Taft-Hartley Act provides.

There is abundant proof of that statement.

While Congress was still trying to write a law that the President would not veto, FACTORY magazine asked workers how they felt about major proposals in the pending House and Senate bills. Overwhelmingly they felt good. They were in favor of almost every individual provision that was finally incorporated into the bill and passed over the President's veto.

The same story emerged from the national opinion poll made by the Opinion Research Corporation of Princeton, N. J. and published by Look magazine after the law was enacted. It showed that union members uniformly favored major provisions of the Act, but were strongly opposed to the Act itself.

This inconsistency is easily explained. Instead of telling their members what the Act does for them, most union leaders have been condemning it as "a slave labor law" because it curtails the leaders' power and recognizes the rights of the union member and the public.

It is not a slave labor law. All of the basic rights accorded to labor by the Wagner Act of 1935 are preserved by the Taft-Hartley law. All of the unfair labor practices that were forbidden by the Wagner Act are still forbidden by the Taft-Hartley Act.

Nothing in the law impairs labor's right to bargain through representatives of its own choosing.

The Wagner Act condemned as an unfair labor practice any effort by employers to coerce employees in the selection of their bargaining representatives. So does the new law.

The Taft-Hartley Act merely recognizes rights of individual employees, of management, and of the public that were ignored by the Wagner Act.

For example, while the Taft-Hartley Act continues the workers' protection from coercion by employers, it also gives them new protection against coercion by unions. The individual worker is freed from the necessity of joining a union to *get* a job. He may still be required to join a union to *keep* his job, but not unless a majority of the workers vote for such a requirement in a government-supervised election.

Some people think the Taft-Hartley Act is weak in protecting the rights of the individual worker. They think that membership in a union should never be made a condition for holding a job. This is true. However, the Act does restore to the individual worker some rights which were blotted out under the Wagner Act, just as it does to management and the public.

A fair examination of the new law's provisions will show that they spring from one dominating purpose: i.e., to re-establish equality before the law.

For example, under the Wagner Act union leaders were free to say whatever they pleased about the employer to his employees. The employer, on the other hand, was denied freedom of speech in talking to his own employees. Now freedom of speech is largely restored.

Under the Wagner Act the employer was compelled to bargain with a certified union. Now the union must bargain, too.

Under the Wagner Act, unions alone had the right to petition for an election to determine whether the petitioning union represented a majority of the workers. Now the employer also has the right to secure an election.

These are features of the new Labor law that management must help workers understand. They must understand why the Act is not the "diabolical monstrosity" Philip Murray tells them it is.

Some companies have already started to explain these things to their workers. Techniques are well established, and they are techniques that any company can use. They include labor law digests in language workers can understand, supervisory conferences to cover points in the Act that affects the supervisor's handling of his job, distribution of reprinted articles that point out how employees benefit from the new law, editorials in plant newspapers and magazines, and advertisements in local newspapers.

II.

Management should take the lead whenever amendments to the Taft-Hartley law become necessary.

For twelve years labor leaders wilfully opposed every attempt to correct obvious abuses in the Wagner Act. We have now proved that a labor law *can* be amended. Let us be sure that management does not resort to the same obstructionist tactics labor has always used.

In carrying out its basic purpose to re-establish equality before the law, the Taft-Hartley Act makes it "unlawful... for any corporation whatever or any labor organization to make a contribution or expenditure in connection with" national elections. Corporations have long been so restrained. The novelty is the balancing restraint upon unions, which now have huge financial resources amounting to very many millions of dollars. However, the language of the Act *may* restrain the labor press from saying what it thinks about candidates, thus impinging upon the freedom of the press. Senator Taft has recognized this possibility.

If it should develop that the Act inadvertently throttles freedom of the press—or misfires otherwise—management should take the lead in securing suitable amendments to the Act. By assuming a completely stiff-necked attitude toward any and all changes in the Wagner Act, no matter how badly needed, the dominant labor leaders and their political outriders finally brought on the sweeping revisions provided by the Taft-Hartley Act. Management must not follow that example of stupid leadership.

III.

Management will be wise if it uses the new law gently in settling labor disputes.

So far employers show no disposition to use the law excessively. That is good. An analysis of the NLRB's docket from August 22 to September 30 shows that approximately 90 percent of the cases now before the Board were filed by unions and employees—not by employers.

We have been surveying employers, asking if they will have occasion to use their right to sue their unions. The answer so far is consistently, "*no.*" That answer frequently is accompanied by this remark, "We certainly hope not. We have no desire to conduct our labor relations in the courthouse."

The desired result should be for the Act to produce only those law suits that are matters of vital principle. As many employers have remarked, the courthouse remains the worst possible place to conduct labor relations. The best place is in the plant—by free collective bargaining between parties enjoying an equality before the law. The Taft-Hartley law will serve its most constructive role if it encourages this kind of collective bargaining.

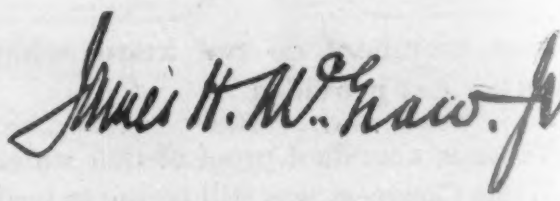
IV.

Employers should not bargain away legal rights accorded to them by the Taft-Hartley Act.

By bargaining away rights given them in that Act, employers serve only to upset a carefully created balance of equality before the law which is an essential element of fair collective bargaining.

Also, by bargaining away rights properly accorded to them, they let down those members of Congress who, in voting for the Act, braved continuous threats of political assassination by powerful union leaders. For their statesmanship in the complicated field covered by the Taft-Hartley Act these Congressmen deserve the support and gratitude of the whole nation—of management, of labor, and of the public alike.

Fairly handled on all sides, the corrective force of the Act can be made a major bulwark of industrial freedom.



President, McGraw-Hill Publishing Company, Inc.

THIS IS THE 62ND OF A SERIES

FACTORY
MANAGEMENT AND MAINTENANCE

L. C. MORROW, EDITOR

MANAGEMENT HAS THE SAME CHANCE THAT LABOR MUFFED

MANAGEMENT has the opportunity to make the Taft-Hartley law work. Labor had the same chance with the Wagner law. Labor muffed. What will management do?

Conditions are the same. Management opposed the Wagner law; labor opposes the Taft-Hartley law. By the Wagner law labor received privileges, management activity was limited. By the Taft-Hartley law management is given back some of the privileges that were taken away; labor is correspondingly proscribed.

Under the Taft-Hartley law, labor unions can be sued; they can be charged with unfair labor practices; and they can be opposed more effectively because of the right of free speech granted management. It is in connection with these three privileges that management must exercise restraint.

It is improbable that the law expects unions to assume greater responsibility than that ordinarily accorded contracting agencies. But the unions say it does. If it does, management must be careful not to make claims that require anything beyond the ordinary rules of responsibility.

As to unfair labor practices by labor, let me quote John L. McCaffrey, president of the International Harvester Company, in a statement before the American Management Association:

"We in management learned about unfair labor practice charges through experience, and sometimes bitter experience, under the one-sided Wagner Act. We learned about unfair labor practice charges by being on the receiving end of them. We know how easy it was for a union to use such charges just to harass us. We know how long it took to educate all levels of management on what could and what could not legally be done or said. Let one foreman make a mistake and the whole management could be tarred with the stigma of unfairness and so represented to employees. We resented that—and justifiably.

"Now we, too, have the power to bring unfair labor practice charges if the occasion arises. I think we can be sure the occasion will arise. Unions and union officials have been used to operating as they pleased. They have not been schooled to obey this new set of rules. Even a union which truly desires to observe the law may suddenly find that one of its stewards or officials has slipped up just as it used to happen to us.

"For that reason I want to urge that we consider carefully the true merits of any unfair labor practice case we may have against a union. We have had the experience of being needled on technicalities. Let us not ourselves do the very thing we have complained about."

So far as free speech is concerned, it should be used, I think, principally to give information. There is much that the worker needs to know about industry, about his company, about the Taft-Hartley law itself. Early exercise of management's regained right of free speech should be confined to the presentation of such information when possible. This is not to say that management should stand quietly by while labor indulges in calumnies. But for that matter, it never did have to.

In this procedure of properly handling the chance that labor muffed, it would seem to be but the application of common sense to: Tell the truth, in simple language. Make a sincere attempt to work cooperatively with the local unions. Invite questions by employees and unions, and answer them fully and frankly.

It is important, too, that management should: Not antagonize by needlessly criticizing unions or their leaders. Not preach. Not brag about management's new rights.

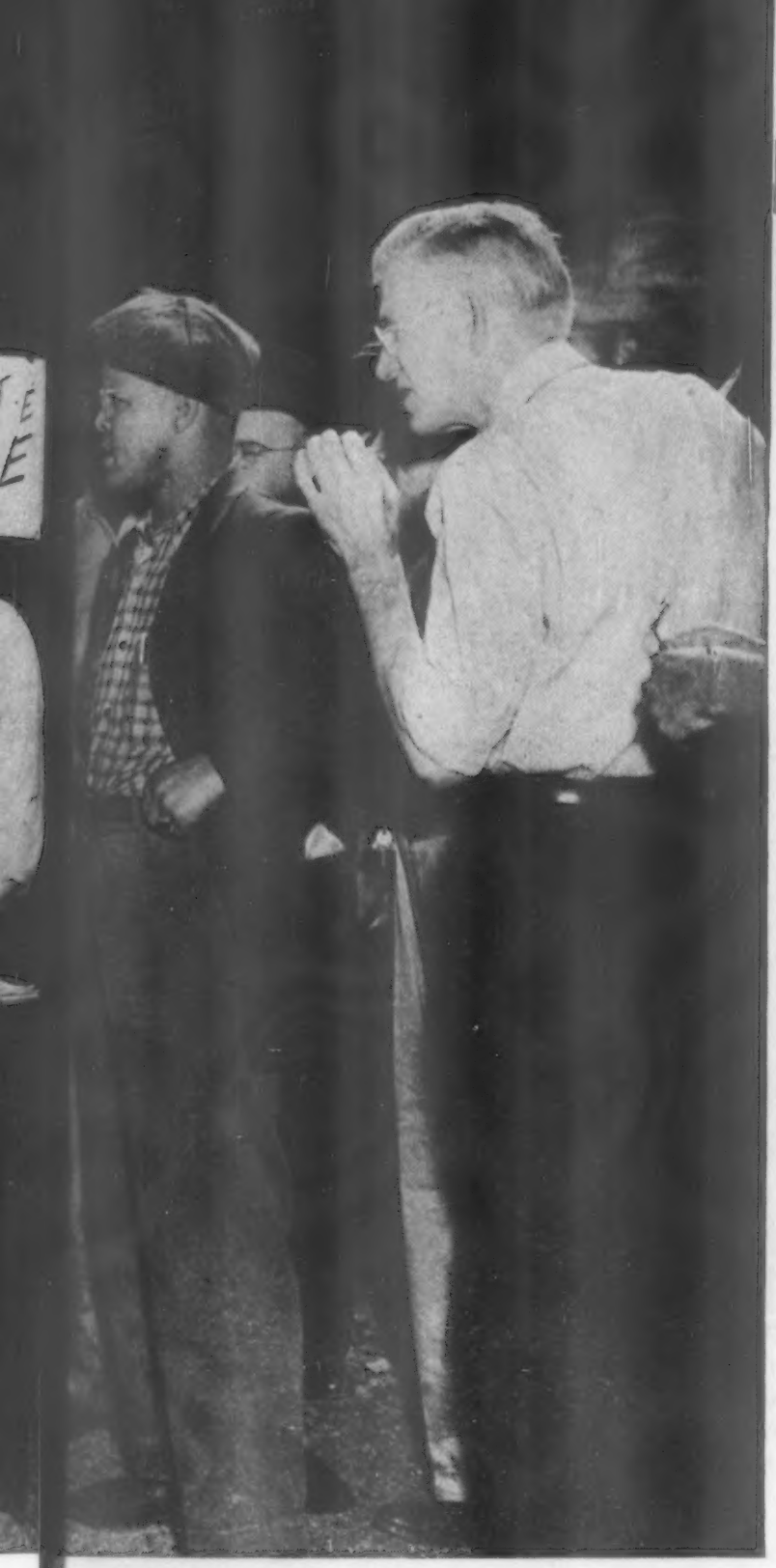
L C Morrow

MANY OF THE 70,000 WHO VOTED HAD TO WAIT IN LINE TO REGISTER. ACTUAL BALLOTING TOOK PLACE IN BOOTH,

WHY FORD WORKERS VOTED DOWN

● *Do workers prefer pennies in their pants to pensions? Do they feel that they can't afford to lay money away for the future? FACTORY asked itself those questions when it became apparent that Ford workers were against a pension plan.*

To bring you the answers, FACTORY sent an editor to Detroit while the voting was still going on. It was his assignment not to examine the merits of the pension plan, but to gather straight facts as to the employees' own reasons for voting the pension down. The information was obtained in private interviews made possible through the unlimited cooperation of the Ford Motor Company.



WAS CAREFULLY SUPERVISED BY UNION, STRICTLY SECRET

THE PENSION PLAN

FORD workers were offered a choice between two contracts. Company and union representatives ratified both, left the choice to a vote of the membership. One provided for 7¢ an hour and a pension plan. The other was the "pattern" increase of 11½¢ plus 3½¢ (for paid holidays) an hour.

The pension plan was turned down cold. The vote was 53,027 to 16,611. In some areas the vote ran 10 and 15 to 1 against the pension.

Why? To get the answer to that question, FACTORY went directly to Ford employees themselves. Almost every worker with whom FACTORY's editor talked had a definite opinion—and was prepared to cite from three to a dozen reasons for his stand. Most of the reasons for voting *against* the plan fell into one of eight classes.

Some of these are fact. Others are purely personal opinion. The rest lie somewhere in between, and may fairly be called expressions of fear based on a lack of understanding of the contract. This fear was heightened by the fact that the contract included merely an "outline" of the retirement plan "to be reduced to writing in detailed form" at a later date.

Here are the eight reasons:

1. Once accepted, the pension plan is not subject to further negotiation. Its terms cannot be changed for 12 years, except by the company. *(Fact—but the union must approve changes in advance.)*

2. The pension plan can be terminated by the company at the end of two years, or at the end of any year thereafter. *(Fact.)*

3. If the pension plan is terminated, men already pensioned would cease to receive benefits, and those still working would get back less than they gave up. *(Fear—based on uncertainty as to whether the 8-cent differential in contracts should be considered by the employee as part of his "contribution.")*

4. Even if the pension is continued indefinitely, men without considerable past service, and men hired in the future, would get back less than they gave up. *(Fear—with the 8-cent differential at the heart of the problem.)*

5. If the pension plan does not go into effect (because the Commissioner of Internal Revenue might refuse to certify it), employees would get back less than they had given up. *(Fear—the 8¢ again.)* And the clause calling for compulsory retirement at 65 would still be in the contract. *(Fear—although this might have to be settled by an arbitrator.)*

6. The plan does not give sufficient credit for past service. *(Personal opinion.)*

7. The company does not commit itself to put any definite amount of money into the retirement fund. *(Fact.)*

8. The plan is part of a speed-up policy. *(Personal opinion.)*

On examination of these reasons, one thing stands out clearly: *Only the last indicates possible opposition to pensions as such.* The others are all more or less specific criticisms of the particular plan offered by the Ford Motor Company.

CONTINUED ON NEXT PAGE

TYPICAL FORD WORKERS STATE THEIR OBJECTIONS TO THE

WILLIAM DOYLE *is a steel maintenance worker with 25 years of service at Ford. He is 51 years old.* "The company can discontinue the plan, but the union can't. Sure I want a pension, but not *this* one. If it could be changed later, so that it was something to build on, I might vote for it even though I don't like some of it"

ANDREW MAULDIN *is a milling machine operator. He is 25, has been with Ford for 7 years.* "The company has all the say. Two of the three men on the pension committee are appointed by the company, and a majority rules. And we can get a bigger pension by using the same 8¢ the company would take away from us"

TWO FACTS STAND OUT

From its on-the-spot investigations, FACTORY can report two definite conclusions:

1. ***The turn-down of the pension was not a rebuff to the UAW leadership,*** which had been almost unanimous in endorsing the plan. Internal, "left *vs.* right" union politics played a part, but the men voted as they did for personal, not political, reasons. Only the outraged minority on the far left sought ideological advantage in rejection. True to form, the Commies screamed bloody murder against anything that might leave the impression that the company was voluntarily giving workers what they wanted.

2. ***Ford workers are still hungry for a pension.*** Almost universal was the comment: "We'll be able to get a better pension a couple of years from now." It would be a big mistake to interpret the pension vote at Ford as meaning that workers want pennies in their pockets instead of retirement pay. It simply means they won't take just anything called "pension plan."

A pretty good indication of what workers *do* want is found by examining more closely their comments on the Ford proposal.

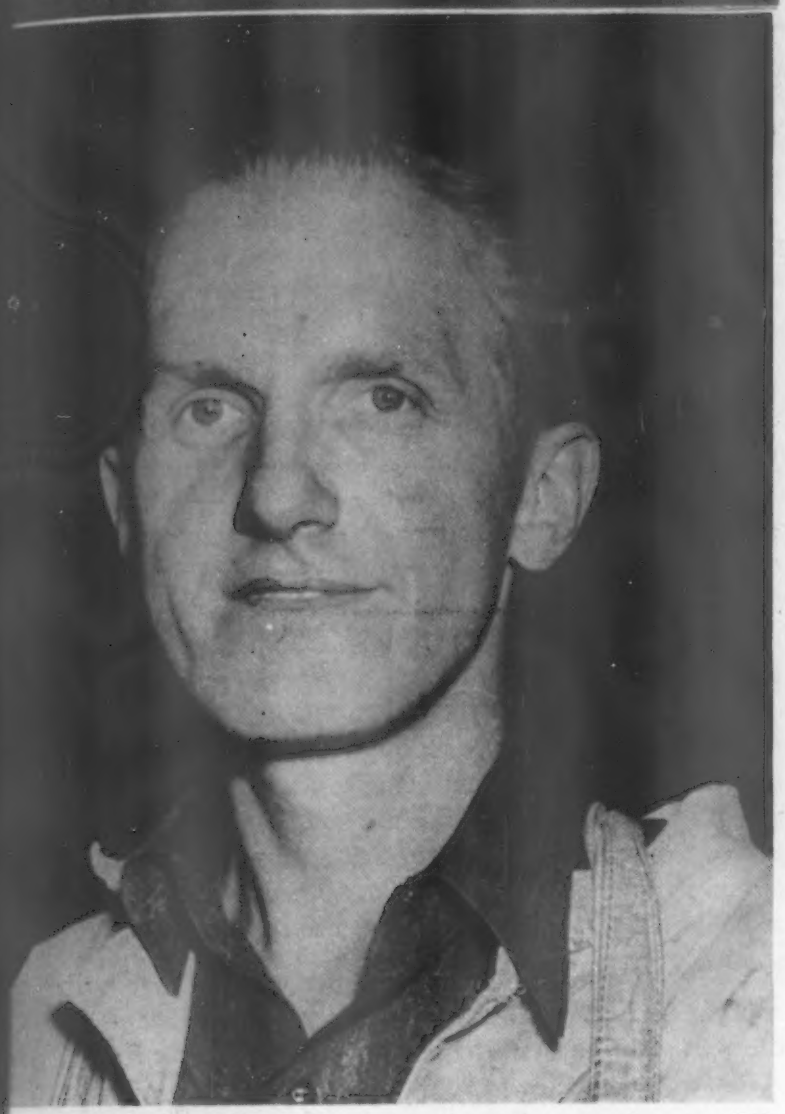
PERIOD OF AGREEMENT. Even proponents of the plan express dislike for the fact that during the 12-year life of the agreement "the union shall not demand any change herein." The formula for determining benefits is specifically covered in this prohibition.

Far more violent is the exception taken to the clause in which the company "reserves the right from time to time to amend, suspend, or terminate the plan." Not mentioned by any of the workers with whom FACTORY talked was the fact that "the plan will not be amended without the prior approval of the union."

TERMINATION. Many employees have sincere fears that the company will exercise its option to terminate the pension plan after two years. They seem unimpressed by this argument in the union newspaper, *Ford Facts:*

"If the Government is not satisfied with the reasons

PENSION PLAN . . .



MICHAEL MERK, *31, is an assembler with 13 years' service.* "We can get a much better plan later. We lose 8¢ an hour and 2½ per cent of what we earn and our paid lunch period. It can be called off after two years, and then what do I get back? And what happens to guys who have already retired?"

for discontinuing a plan, the company . . . is subject to high penalties in the form of retroactive tax payments and fines . . . The Mine Workers' Health and Welfare fund can be terminated upon 30 days' notice. Nobody seems to worry about that!"

Most workers took the attitude that an "escape clause" was a necessary protection for the company, but they felt that they, too, were entitled to a similar termination period. "Why should they be able to get out in 2 years when we're stuck with it for 12?" was a typical reaction.

BENEFITS AT TERMINATION. Principal fear of those who object to the termination provisions was summed up in this question of one Ford worker:

"I give up 8¢ an hour [the difference between the two contracts] and also kick in with 2½ per cent of my wages. Then they decide to call the whole thing off. And what have I got left?"

Many employees fear that the answer is an unqualified "nothing." Others are aware that the contract provides that "in the event of such [termination] all of the assets of the fund shall be used for the exclusive benefit of the members of the plan." But that still doesn't satisfy some of them.

"Look," one of these men said, "all that *has* to go into the fund is the 2½ per cent the company takes out of wages. That 8¢ I'm giving up doesn't have to go into the fund as long as there is enough money in the kitty to meet what the contract calls 'current obligations.' What does that mean? Just this. A hundred thousand guys like me kick in 2½ per cent, or about 60 bucks a year. Figure it out. That's 6 million bucks!

"Okay, the company says 7700 men will be eligible to retire at the end of this year. They'll get about $50 a month or $600 a year from the pension fund. That's a little less than 5 million dollars. Which means the company wouldn't have to put up a red cent to keep the plan going for 2 years. Then they call it off and there's all of 2 million bucks to use for 'the benefit of the members.' That ain't going to keep 8000 pensioners happy for long, and it sure as hell ain't going to get me my $120 back, to say nothing of the 8¢ an hour I kissed goodbye."

In apparent contradiction is the statement in Local 600's *Ford Facts* that a worker *who breaks his service* "has a vested right in his own contributions (including the 8¢ per hour) and all company contributions." The paper does not contend, in so many words, that the worker would have the same vested rights in the event of a termination of the plan.

The contract itself is vague on this point. The outline says only that "no member [of the plan] shall have any legal or equitable right or interest . . . not expressly granted in the plan." Just *what* rights will be granted in the final plan is not stated.

All of which adds up to workers being pretty thoroughly confused on this point, with the great majority of them seriously worried about the possibility of pensioners being cut off without benefits and without the right to reinstatement.

AMOUNT OF BENEFITS. It is not surprising to find workers demanding more money these days. So gripes about the pension benefits being too small were more or less expected.

But there was one story going the rounds at the Ford Rouge plant that was having a devastating effect on the younger men who heard it. The man who apparently started this story claims his brother is an insurance actuary. This is how he tells it:

"I'm 20 years old and I've only been here a short time. But I'm earning close to the 'average' 1946 Ford wage of $2234. So I 'contribute' 2½ per cent of that, or $55.85 a year. And I also lose 8¢ an hour, or about $160 a year, figuring fifty 40-hour weeks. In return for that, after 45 years of service, I'll get a pension of $1005.30 a year.

"But suppose instead I take that $215.85 and buy an annuity from an insurance company – to start at 65, just like the pension. I get $1430 a year. In other words, for the privilege of buying my annuity through the Ford Motor Company I would be sacrificing $425 a year. Call your own insurance man and check it."

CONTINUED ON NEXT PAGE

This story was typewritten on a 3x5 card – and it had had a lot of circulation. Almost everyone under 30 with whom FACTORY talked referred to it. So did several older men, although most of them realized that the credit they receive for past service will give them pensions far in excess of anything they could afford to buy if they start at this late date.

NON-CERTIFICATION OF PLAN. Nobody paid much attention to the fact that pension plans have to qualify with the Commissioner of Internal Revenue – until the union's "independent pension expert" spoke up. According to the Local 400 newspaper, *Watchword,* this "expert" informed the Ford Council that "70 per cent of the employees had to sign up under the pension plan before it could go into effect."

Even if the pension contract *had* been adopted, individual participation would have been on a voluntary basis. So Local 400 came to the conclusion that, if 70 per cent did not sign up voluntarily, the plan could not go into effect. And "they [the employees] will not have the right to the alternate wage package instead ... [nor] the 8¢, the paid lunch period, and other benefits waived in lieu of a pension program."

Some employees construed this to mean that all contributions (retroactive to May 31, 1947) would be forfeited. The agreement provides that, if the plan is not approved, "all contributions deducted from an employee's wages shall be returned to him, but without interest."

Two Ford workers were rather bitter in pointing out to FACTORY:

"Sure, they're big about it. They'll give us back the 2½ per cent they actually deducted, and keep the 8¢ for themselves. Besides, we'd still be stuck with the 65-year retirement age. Just because the pension doesn't get certified doesn't give the union the right to cancel the whole thing. I know there's a lot of legal double-talk in the contract about who can cancel and why, but I'll bet every nickel I got on that one."

FACTORY can understand why workers felt the agreement obscure on this point. Confused, workers apparently chose to believe the worst. Of course, an understanding may have been reached during negotiations between company and union representatives, but if so, workers did not seem to be aware of it.

PAST SERVICE CREDIT. Retirement benefits are computed on two different bases for past and future service. The formula for determining the annual retirement income is as follows:

One-half of 1 per cent of 1946 base wages for each year of past service before age 40; 8/10 per cent of 1946 base wages for each year of past service between 40 and 55; 1¼ per cent of 1946 base wages for each year of past service rendered after age 55. For future service, 1 per cent of compensation up to $3000 in any year, plus 2 per cent of everything over $3000.

However, employees find it difficult to understand why a man who retires today with 45 years' service should receive a smaller monthly pension than a man who starts today and retires 45 years hence. Nor do they understand why a man retiring at 65 after 30 years' service should get more than a man who retires at 55 after a similar period of service to the company.

A common complaint was that everyone should be able to retire after a given number of years (25 or 30 was the usual suggestion) with a definite pension, regardless of age. Employees were likely to cite civil service pensions as the "standard" to be adopted.

COMPANY CONTRIBUTIONS. The outline of the retirement plan states that "the company intends at its own expense to make ... contributions ... required, in addition to the employee's contribution, to provide the current cost of the benefits."

Some employees say this is a snare and a delusion; that the company would not actually have to make any contributions. But an official UAW release, dated August 31, estimates the cost of past service benefits (amount needed to make up for past years, when employees contributed nothing) to the company at $221,000,000 and the *minimum* cost to the company over an 11¼-year funding period at $13,000,000 per year.

A deluge of conflicting figures has Ford workers thoroughly confused. Here is a typical reaction:

"I don't know how much a pension costs. As long as the company puts in enough to do the job, that's okay with me. But I just want to make sure that I'm not going to be left holding the bag. There's plenty in the contract about how much I'm going to pay, but not a damn thing about the company. I want to at least be sure they'll put in the 8¢ an hour I'm giving up."

SPEED-UP. Denunciations of the pension plan as part of a "speed-up" program are not really criticisms of the plan, but rather of the motives prompting it.

Most of the cries of "speed-up" were tied in with objections to other features of the plan, although some employees felt that, "even if everything about the plan is on the up-and-up," the company would push younger men enough to pay the cost of pensions.

So far as FACTORY could determine, speed-up talk came primarily from radical left-wingers and habitual malcontents. Some well-meaning workers, however, thought they saw in the possibility of termination after two years, a plan to get rid of older men and then "dump" them.

"They might not try to drive us younger fellows any harder, but they'd just naturally get more production from fewer men if they got rid of the old-timers."

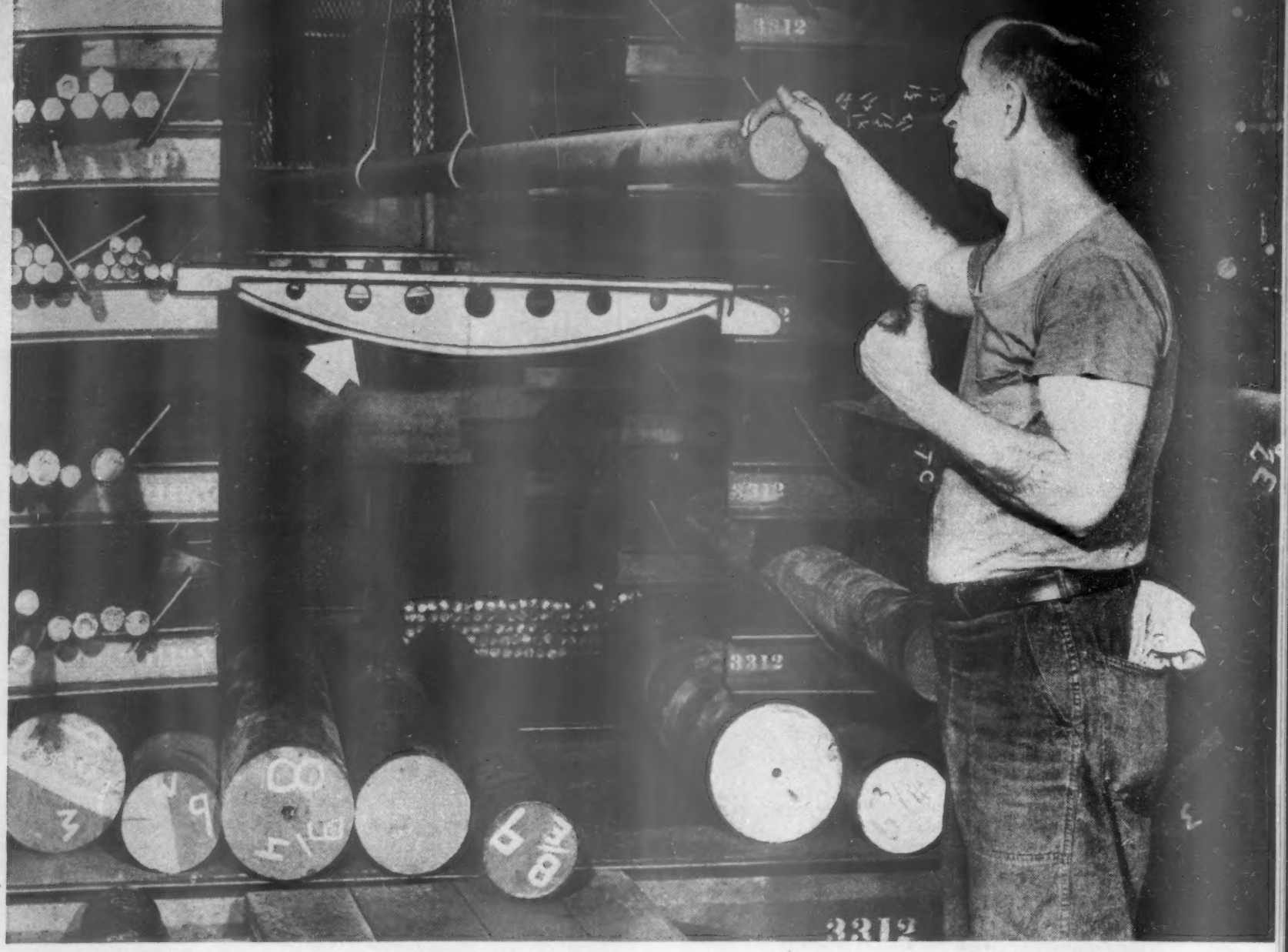
* * *

Those are the sentiments Ford workers voiced to FACTORY. Those are the sentiments they voted when they went to the polls in a genuinely democratic election to choose which of two contracts they wanted.

This was no "rigged" election. It was all done by secret ballot. To vote, men had to show their union cards and turn in their latest pay stubs. Sometimes they could vote right away, but more often they had to stand in line and wait from 5 to 15 minutes.

And yet better than 65 per cent of all eligible Ford workers voted. They didn't go to all that trouble because they weren't interested. Or to embarrass a rival union leader. Or even because someone told them to.

They went to the polls to say that they didn't like the pension plan that was offered them.



BAR STOCK IS LOWERED BY TRAVELING CRANE TO BRIDGE (ARROW) AND ROLLED ONTO CROSSARMS OF ALL-WELDED STORAGE RACK

HOW ONE COMPANY SOLVED ITS BAR STOCK STORAGE PROBLEM

CHARLES H. PARKS • ASSISTANT WORKS MANAGER, THE BULLARD COMPANY BRIDGEPORT, CONN.

BAR STOCK is stored on "telephone pole" racks at The Bullard Company. Using specially designed bridges, they provide a safe and convenient method of handling rounds, tubing, squares, flats, and other shapes. It's easy to get at any piece of material at any time.

Racks are of all-welded construction. Uprights are standard H-sections. Crossarms are ordinary I-beams. Height between crossarms is figured so that overloading is impossible. Removable stops keep bars from rolling off the high shelves.

Distance between ends of crossarms is kept to a uniform 3 feet. Bridges of high-strength aluminum alloy weighing 18 pounds are used to span the gap when bars are loaded into racks or removed from them. On end racks, half bridges weighing 10 pounds are used. These fit between the I-beam flanges.

Racks Easily Loaded

To load racks, bridges are placed as shown in the photograph. Bar or bars are lowered to bridge by overhead crane, rolled onto cross-arms.

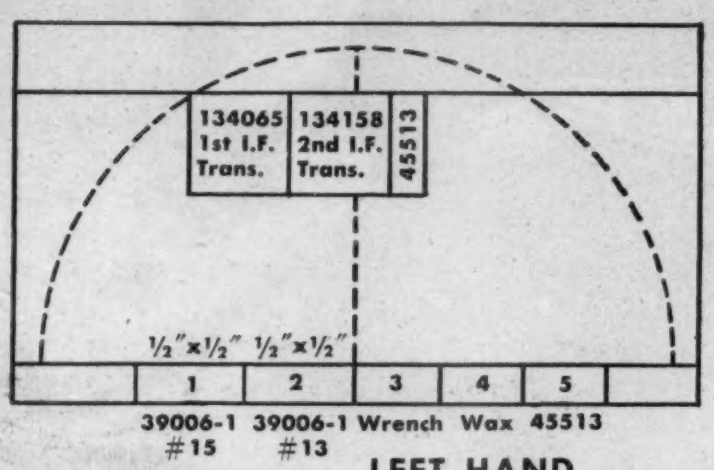
To get a bar from the rack, the desired piece and all the bars in front of it are rolled out onto the bridge. Slings are then put around the wanted bar, whereupon the crane picks it up and carries it away. The bars that were not wanted are then rolled back onto the crossarms.

Flats, rectangular stock, and odd shapes are stored on top of the racks. Bars are marked on the ends in code colors. And, so far as possible, steels are segregated by types.

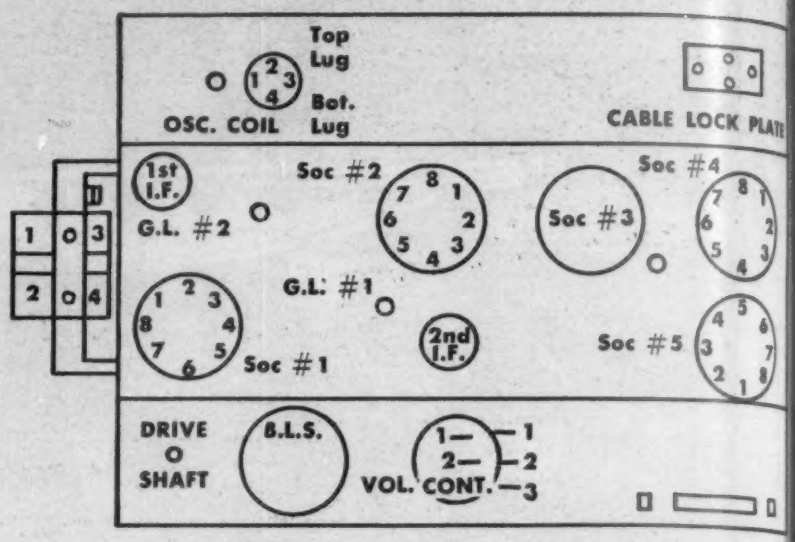
Each rack will hold up to 90 tons of steel. Because of the heavy concentration of weights, the floor slab under the racks is insulated from the rest of the floor; if any settling takes place, the building and crane runway will not be affected.

MODEL 116 CHASSIS

Pos #2



39006-1 #15 39006-1 #13 Wrench Wax 45513



LEFT HAND	RIGHT HAND
Pass chassis to next position	Get chassis from Position #1
Pick up 1st I.F. transformer	Straighten wires on I.F.
Place transformer through chassis	Assist in placing transformer
Hold transformer in position on chassis	Pick up wrench and place over palnut on pad
Hold transformer in position on chassis	Place nut to threaded stud of transformer and drive down
Hold transformer in position on chassis	Place wrench over palnut on pad
Hold transformer in position on chassis	Place nut to threaded stud of transformer and drive down
Pick up 2nd I.F. Transformer	Hold wrench, straighten wires
Place transformer through chassis	Assist in placing transformer
Hold transformer in position on chassis	Place wrench over palnut on pad
Hold transformer in position on chassis	Place nut to threaded stud of transformer and drive down
Hold transformer in position on chassis	Place wrench over palnut on pad
Hold transformer in position on chassis	Place nut to threaded stud of transformer and drive down
Pick up from #1, and #2	Place wrench to #3, pick up pliers
Place 1st end of wire from #2 to socket #5 lug #8	Clamp wire to lug
Place 2nd end of wire from #2 to socket #4 lug #8	Clamp wire to lug
Place 1st end of wire from #1 to socket #4 lug #5	Clamp wire to lug
Place 2nd end of wire from #1 to socket #2 lug #3	Clamp wire to lug
Finish placing red solid lead of 1st I.F. to socket #1 lug #2	Clamp wire to lug, place pliers on bench

TOOLS

Long Nose Pliers
Diagonal Pliers
Air Wrench with 5/16" Hex Socket

MATERIAL PREPARATION

Position pad	Pick up hand full of palnuts
Assist in turning palnuts in position	Place on pad and position flat side down.

JOB INSTRUCTION SHEET is kept in front of trainee or experienced operator learning new model. Sheet shows diagram of model workplace, layout, tools needed, instructions for preparation of materials, instruction for left and right hand motions

ON-THE-LINE TRAINING WITH JOB

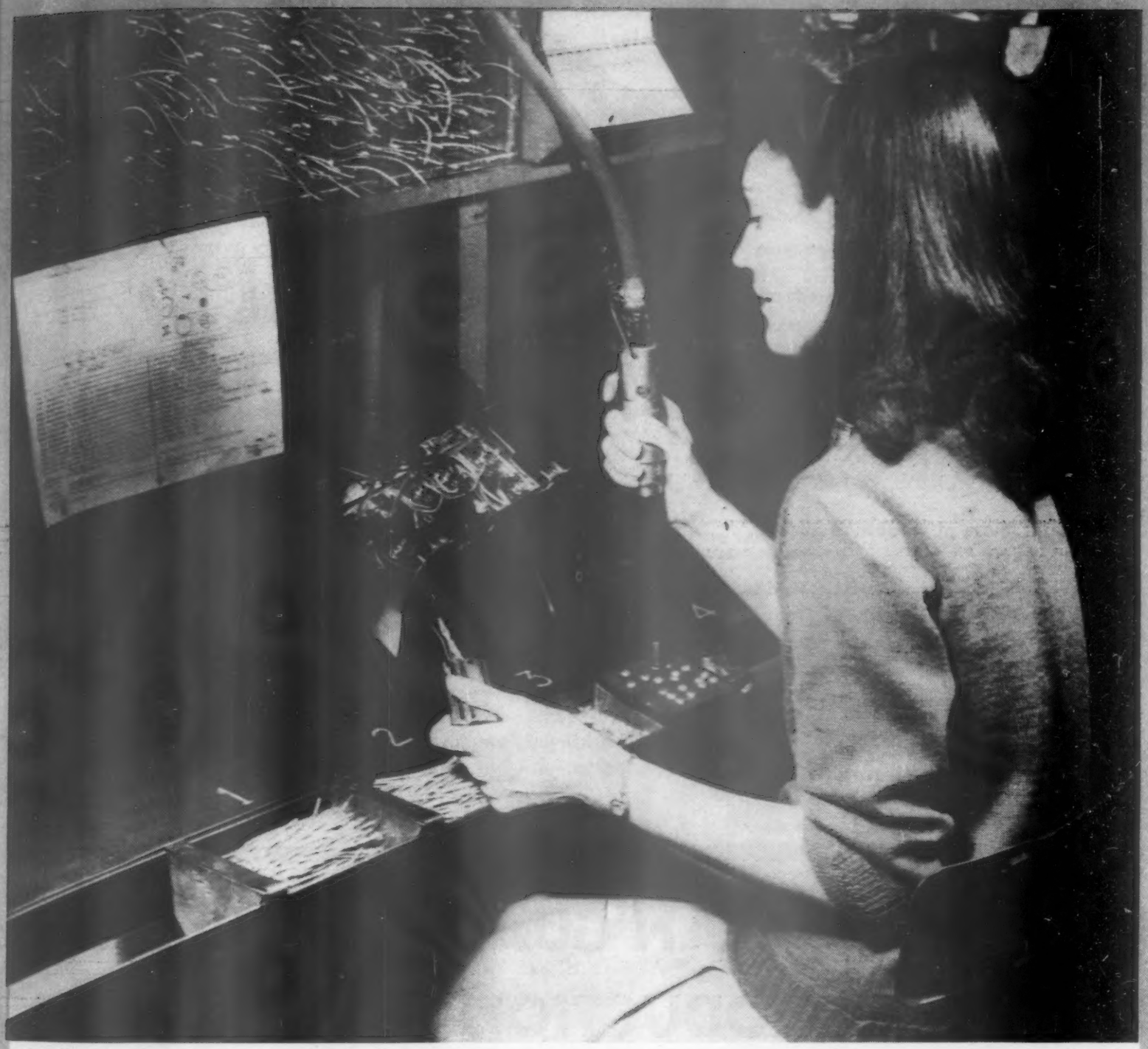
FRANK X. DROEGE • TIME-STUDY SUPERVISOR, CROSLEY DIVISION THE AVIATION CORPORATION, CINCINNATI

TRAINING new operators for assembly work has been one of Crosley's big headaches. The problem was how to train them quickly and at low cost.

Job instruction sheets proved to be their answer. Sheets were prepared by time-study engineers for each assembly position on every model. At the top of each sheet appears the model number and the position number. In the upper left is a diagram of the standard work area. Parts positions for the operations are placed on the diagram by the standards department.

In the upper right corner of the job instruction sheet appears a diagram of a flattened-out chassis.

On this diagram are indicated in color the parts to be installed in the operation. For example, a red line from lug No. 3 on socket No. 2 to lug No. 5 on socket No. 4 tells the operator that a 6-in. wire will be used



TRAINEES LEARN ON THE LINE, get directly from job instruction sheets all the information they need about their part of the assembly operation; reach maximum productivity in minimum learning time—all to the tune of important dollar savings

INSTRUCTION SHEETS

between the two points. The method of numbering sockets and lugs on parts was standardized.

The lower half of the instruction sheet is devoted to a description of motion sequences for each hand in the operation. Tools are listed in the lower left corner. Orders for material preparation are placed at bottom center; and in the lower right are initials of the time-study engineer and the date. Sheets are duplicated in small quantities for each position.

Chart Plainly Visible

In use, the chart is posted on the parts rack in front of the operator. She places on the chassis the parts in positions specified on the instruction sheet; checks sheet for tools needed; and has a constant reminder of the proper method of assembly before her. The chart tells her everything she needs to know.

So effective is this method of on-the-line training that the line does not have to be slowed down to accommodate new operators. They reach maximum productivity at minimum cost and in shortest possible training time.

SHARE-OF-PRODUCTION WAGE PLAN STATEMENT*

(Issued to hourly employees each 4-week period)

1	**Gross sales value of production**	**$400,000.00**	
	Deduct returns and allowances	325.00	
2	**Net sales value of production**	**399,675,00**	
	Deduct materials bought from others	198,000.00	
3	**Production values created within the company**	**201,675.00**	
4	**Share of production account @ 30.51% of production values**	**61,531.04**	
	Deduct regular pay, previously announced	51,531.04	
5	**Share of production credit**	**10,000.00**	
	A. Held in reserve	2,500.00	4.07% of wages paid
	B. To pension and retirement fund this period	3,750.00	6.09% of wages paid
	C. Cash distribution this period	3,750.00	6.09% of wages paid
		10,000.00	**16.25%** of wages paid

The cash payment for the period is 6.09% of each hourly employee's total earnings for the period

*All figures in this statement are hypothetical

NEW WAGE PLAN GUARANTEES SHARE OF PRODUCTION

ALAN J. WOODFIELD • INDUSTRIAL ENGINEERING SUPERVISOR, CONTINENTAL PAPER COMPANY, RIDGEFIELD PARK, N. J.

A NEW wage payment plan at Continental guarantees each hourly worker a fixed share of the production values he helps to create. Both the company and its employees believe this pledge means labor-management harmony and mutual prosperity.

Basis for this belief is the confidence of both parties in the underlying philosophies of the plan, whereby the company makes money *with* its employees and not *out* of them. After only four weeks' operation under the new plan, an additional 20 per cent of the regular payroll was earned by hourly workers for distribution according to its terms. This was boosted to 30.7 per cent in the second period. How much more employees can earn under this plan, no one yet knows. But this everyone knows—*there is no more of a ceiling on employee earnings than on company profits.*

The plan is a proprietary one. It was developed and installed by a firm of management consultants. It is based upon these simple economic truths:

1. The only money a company can pay to its suppliers and employees is that collected from its customers for goods made and sold.

2. Payrolls and production values rise and fall together; if production values can be increased, payrolls and individual compensation can be expanded automatically.

3. Production value is that portion of the sales value of finished goods which is created *inside* the plant. Pay is proportionate to productivity, and payrolls are a consistent and stable percentage of production values.

Here is another way of saying it. For the 40-year period prior to World War II, statistics show that the American factory worker received in wages a fairly constant percentage of difference between the cost of raw materials and the sales price of the finished product.

This national percentage has been unaffected by booms or depressions, by peace or war. It differs for particular firms, but generally not within any single firm. (These observations and their economic implications were presented in detail in "The Only Source of Higher Wages Is Greater Output," FACTORY, February, 1946).

A Fixed Share

In obtaining the agreement of the union (United Paper Workers of America, Local 299, CIO) Continental has done two things:

1. It has guaranteed to workers their historically "fixed" share in the fruits of production. A fixed percentage of 30.51 was derived from the company's books of accounts. This represents the yearly mean of the ratio of wages paid to the "value added by manufacture" for the 5-year period from 1936 to 1940 inclusive. Significantly, it was found that there was no deviation from this mean in any of those years in excess of ½ of 1 per cent.

It must be noted that, because this figure is based on the company's own experience, it cannot arbitrarily be lifted out and applied elsewhere. Its development required careful consideration of many factors of variable and fixed costs not possible to describe here.

2. It has provided an incentive both for greater output and for increased earnings by hourly workers as derived from (a) savings in raw materials, supplies, fuel, power, and repairs per ton of output; (b) savings in labor cost (100 per cent goes to employees); (c) reductions in breakages, defectives, and returns; (d) increases in salable tonnage produced per year; (e) increases in prices of tonnage sold.

These features have fulfilled the company's desire to find an incentive plan that did not pay a bonus purely on physical volume. Quality cannot be sacrificed for quantity without penalty of lowered earnings. The company also preferred the plan because increased earnings made possible under the first four of the five items under (2) above are largely controllable by the employees themselves. Theirs was to be the realization that higher wages stem *both* from greater output and lower operating costs. The effect of this thinking on worker absenteeism, indifference, or carelessness is self-evident. Workers now feel they have a stake in the business!

Under the plan, employees continue to be paid their legal and contractual straight-time and overtime rates of pay on established pay days. Additional share-of-production earnings are computed and paid at the end of a given accounting period —in the case of Continental, at the close of each 4-week period.

At that time an accounting statement is prepared (see facing page) to derive the workers' fixed share of 30.51 per cent of the "created" production values. If the amount already paid in base wages is less than this share, the differences are paid out as follows:

1. One-quarter is placed in reserve against seasonal influences.

2. The remaining three-quarters are divided in half. One-half goes into immediate cash payments to all hourly employees, and one-half is deposited into a new pension fund to provide retirement income. Money in the latter fund is prorated and used to purchase single-payment annuities.

If the total regular pay of employees, at contractual wage rates (including overtime), should exceed the dollar amount of share-of-production credit in any 6-month period, the difference is absorbed by the company. Twice each year, just before vacation time and at Christmas, the reserve account is closed out. If this account shows a surplus, half of this surplus is paid in cash to the workers and half goes to the pension fund. If the account shows a deficit, the company absorbs it, and starts the account clear for the next term. It is notable that in any one 4-week period, the plan always pays out three-quarters of the amount due, regardless of the condition of the reserve.

The plan is not a profit-sharing plan, because workers receive not less than their contractual and legal regular rates of pay (including overtime) and additional earnings up to the dollar value of their fixed share-of-production values, *whether or not the company makes any profit.*

The plan has combined some unusual advantages under one cover. Because it applies to all hourly paid workers (including indirect and maintenance workers), it recognizes the efforts of workers as a team, and compensates each one on an equal basis. Since any changes in sales prices—which generally reflect changes in living costs—are included in the formula, the plan automatically provides for cost-of-living adjustments in current wages, and eliminates distressing delays dependent on lagging labor-management negotiations.

Some feel that the plan has in it greatly improved assurance of stable employment and employee earnings. Others go further in feeling the plan might very well develop into a potent remedy against acceptance of basic communistic doctrine by proving that the worker benefits immeasurably more when both labor union and management agree to a non-arbitrary division of the created wealth they cooperatively manufacture. For no matter which way the "profit-or-loss" figures fall, under this plan workers get a definite share of what they help to produce. (Incidentally, salaried workers are not put at a disadvantage; they participate in a profit-sharing plan of their own.)

Greater Output Expected

What does the company gain from this plan? Obviously it expects that increased output and lower costs will result from workers' efforts to create greater production values. In one sense, management is gambling on increased production to exceed fixed costs. Thereby it hopes to climb more quickly and further beyond the "break-even" point at which it begins to realize profits. After that point is reached, the company's share will be 69.49 cents of each dollar of production value. This will go directly to profits (before taxes and after certain other expenses are covered) to take care of its stockholders and expansion requirements. But, profits or no, the portion of 30.51 per cent of production values is *guaranteed* to the worker.

COLORFUL LOBBY is used by J & J employees, executives, and visitors alike. Workers pass down stairway behind reception desk. At extreme right is corridor to offices. Entire manufacturing area is plainly visible through "picture" window

THE BEAUTIFUL PLANT IS MORE

H. G. FROMM • PLANT MANAGER, JOHNSON & JOHNSON BABY PRODUCTS PLANT, CRANFORD, N. J.

THE title of this article sums up Johnson & Johnson's building philosophy. *A plant can represent the latest in functional efficiency and still retain its architectural beauty.*

Witness plant after plant built by Johnson & Johnson in the past few years. As a matter of fact, these plants prompt us to state that a plant is not fully efficient unless it is beautiful, because of the psychological effect both upon employees and the community.

A case in point is our new Baby Products Plant. It is certainly beautiful, and we think its beauty has a lot to do with its efficiency. How much? Suppose we leave it to the reader to decide.

First, in designing this plant the lowest possible operating costs were sought. However, of prime concern were facilities to obtain the best quality products possible. But management did not stop there. It believed that its employees were the determining factor in plant operating efficiency for highest output. All possible refinements, therefore, in physical conveniences and in en-

EFFICIENT

vironment favorable to the worker's health, attitude, and comfort were adopted.

Last and newest, perhaps, of the four considerations was the distinct effort to create and expand customer good-will. To this end, building and equipment design conducive to good public relations were included as a justifiable cost of the project.

Of single-story steel and masonry construction, the building was centered on a 30-acre landscaped plot to allow for four-way expansion. It is rectangular in shape, 250x315 feet, with a single, corner entrance for employees, executives, and visitors. For here everybody comes in the front door with the boss.

Employees pass through a colorfully furnished reception lobby and down one flight of stairs to a basement service section underlying almost half of one side of the building. Here in part are located rest rooms, lockers, and showers. Access to working areas is by a stairway and corridor leading to the center of the main floor. At this point are located the time clocks, bulletin boards, as well as the manufacturing offices, process control laboratory, and first-aid room.

Centralized Services

This centralization minimizes employee traffic and facilitates supervisory control. It provides, too, for a minimum of dislocation, regardless of the extent of later plant expansion. To accommodate future expansion, all plant service facilities, such as air compressors and air-conditioning equipment, were located near the center of the basement, as was also the maintenance machine shop.

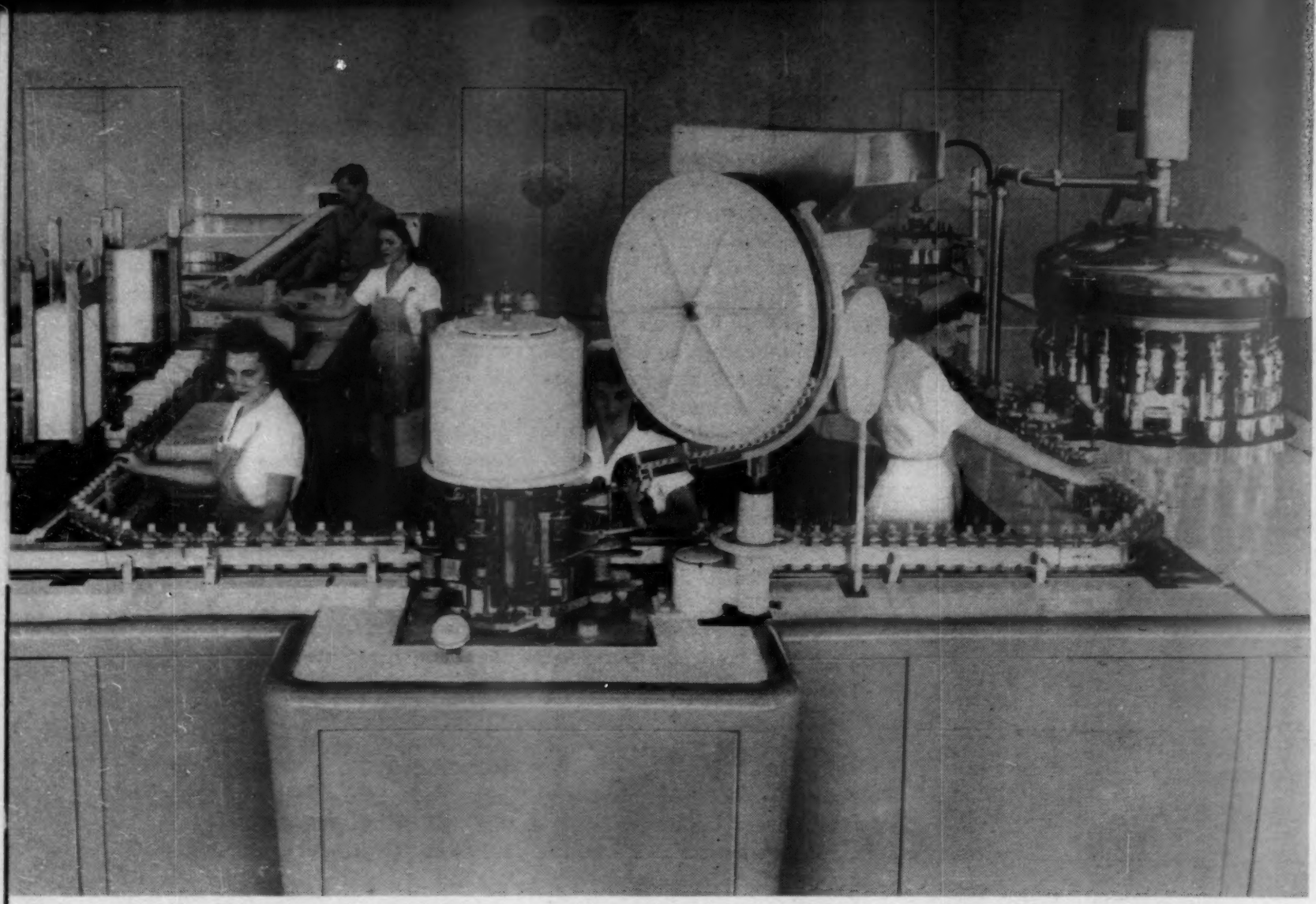
The main floor is divided into three major sections. Along the entire front of the building are the executive offices, cafeteria, plant broadcasting room, and an after-luncheon lounge for employees. It wasn't an accident that the cafeteria and lounge facilities were located in the far corner with an outside entrance, because here they can be closed off and used for employee social functions after working hours.

Behind the lobby, and visible from it through a large plate-glass window, is the 50-ft.-wide manufacturing area extending some 285 feet toward the rear of the plant. Adjacent to this area is the warehouse section devoted to receiving of raw materials, delivery to manufacturing lines, storage of finished goods, and shipping. All but the warehouse area are air-conditioned.

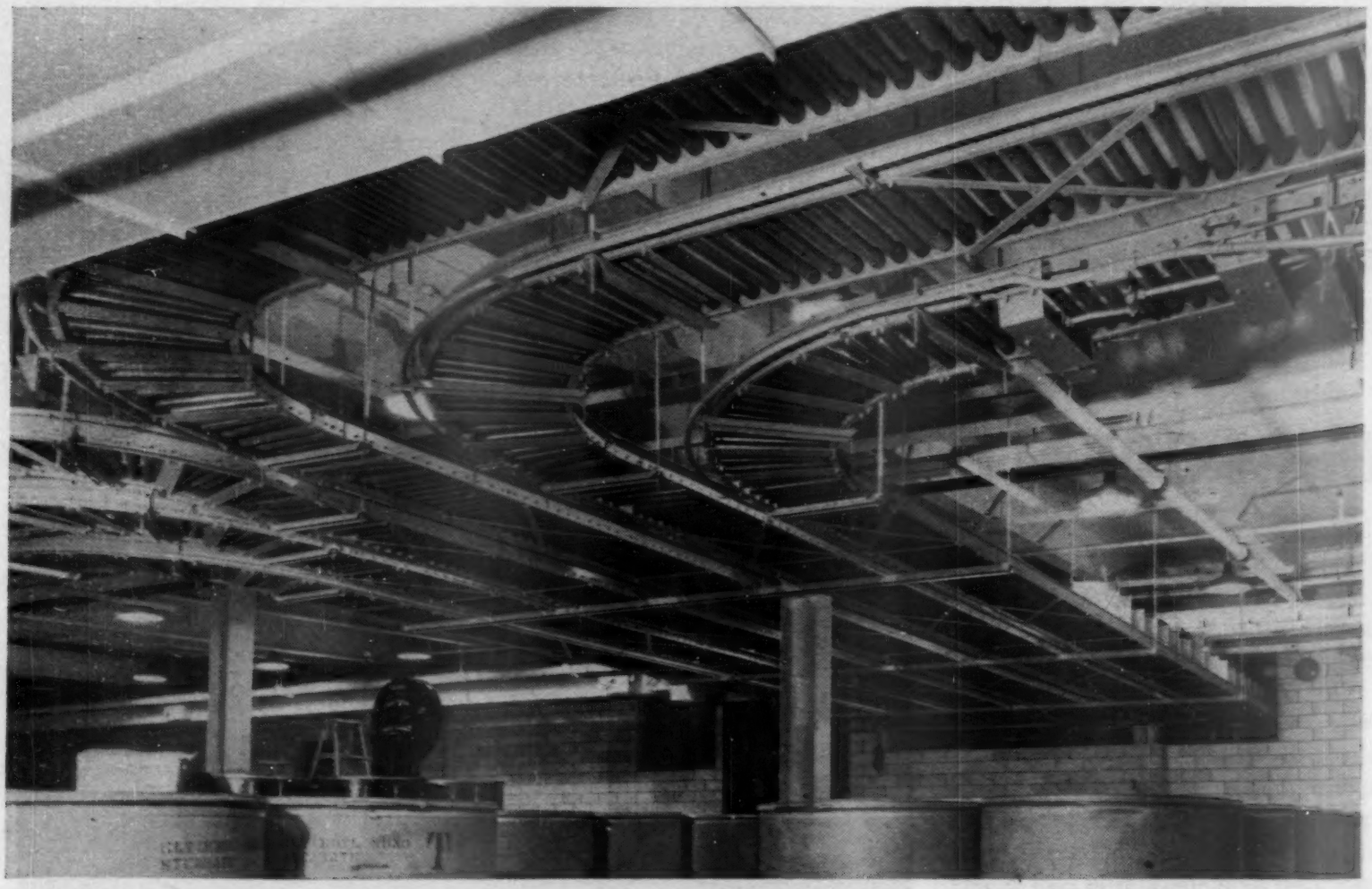
Packaging machinery of the fully-automatic type is laid out in six continuous U-shaped lines in the manufacturing area. The ends of each "U" project through wall openings into the warehouse area. Raw materials are brought up and loaded into one leg of each line "behind the scenes," and finished products are similarly removed and placed in cartons.

From this point a comprehensive belt and roller conveyor system hung in the basement connects each line to a central carton-sealing ma-

EMPLOYEES' LOUNGE, adjacent to the cafeteria, provides for after-luncheon recreation. Both lounge and cafeteria are located so they can be used for parties after hours



FRONT VIEW of one of six U-shaped packaging conveyor lines, which are built for motion economy and minimum operator fatigue. Level of conveyor line was set for best "seeing" rather than easiest working height because operators inspect product much more than handle it. Materials flow continuously into and out of each conveyor line through openings in rear wall



OVERHEAD basement conveyors, one from each of the six packaging lines, carry unsealed cartons to a single line in center of plant which leads to one sealing machine. Cartons are fed to these conveyors from chutes at the warehouse end of each packaging line. Conveyors automatically hold unsealed cartons in temporary storage until drawn at will into the sealing line

BEHIND-THE-WALL VIEW of the same packaging line shown on facing page. Note how all extraneous operations, such as feeding empty bottles (rear conveyor) and packaging finished product (foreground), are performed on warehouse side of wall

CARTON SEALING machine in central warehouse area is operated by one man. Guided by telltale lights (arrow points to signal board) which show backlog on each of the six conveyor lines, he exercises remote pushbutton control over entire system

chine. Located strategically in the center of the area, this machine is operated by one man who has push-button control over all six feeder lines. Guided by signal lights showing the backlog on each line, he controls the movement of cartons in the entire system. From the sealing machine, which is electrically adjustable for all carton sizes, all cartons are delivered to a single terminal where they are palletized for storage and shipment.

Fatigue Minimized

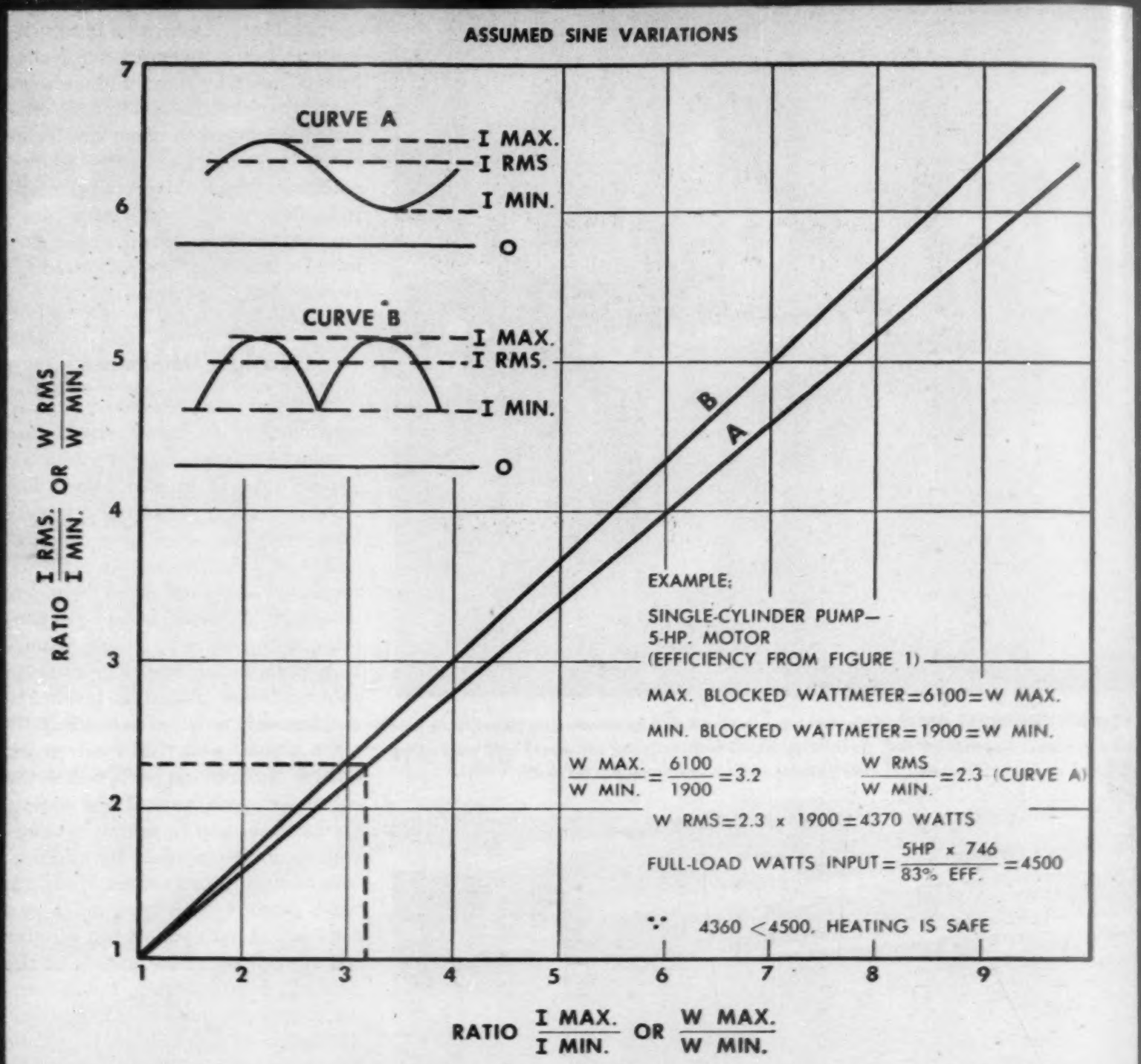
No detail was overlooked in plant construction to attain maximum employee efficiency with minimum expenditure of human effort. For example, the packaging conveyor lines were set at a best "seeing" height of 39 inches, rather than the normally accepted best working height of 34 inches, because operators do considerably more inspection than handling. Pushbutton controls were placed at levels requiring only a wrist movement.

On these same lines all gears, chains, and moving parts below the conveyor were housed for safety, appearance, and to permit concentration on the product by elimination of visual distraction. Housings were painted with blue sides and contrasting light yellow top, also for easier "seeing." Side panels of the housings were sloped inward toward the bottom, to give a "toe-in." This allowed working closer to the bench, and minimized backbending.

Noise reduction, good lighting, and the psychology of color were not ignored in the manufacturing area. The vinyl-resin plastic flooring was chosen with a white marbleized pattern for better reflectivity. On the end walls the soft receding gray background is so effective that the chances are the employees couldn't tell you the color if faced with the question. But they do realize that the surroundings are restful.

This is the plant that is geared to produce hundreds of tons of quality baby powder, oil, lotion, and cream each year. Is it at all surprising to learn that such facilities have been provided for a total of about 80 employees to enable them to do a good job with minimum fatigue?

ROOT-MEAN-SQUARE FROM MAXIMUM AND MINIMUM VALUES


ASSUMED SINE VARIATIONS
CURVE A
I MAX.
I RMS
I MIN.
O
CURVE B
I MAX.
I RMS.
I MIN.
O
RATIO I RMS./I MIN. OR W RMS/W MIN.
B
A
EXAMPLE:
SINGLE-CYLINDER PUMP—
5-HP. MOTOR
(EFFICIENCY FROM FIGURE 1)
MAX. BLOCKED WATTMETER=6100=W MAX.
MIN. BLOCKED WATTMETER=1900=W MIN.
W MAX./W MIN. = 6100/1900 = 3.2
W RMS/W MIN. = 2.3 (CURVE A)
W RMS = 2.3 x 1900 = 4370 WATTS
FULL-LOAD WATTS INPUT = 5HP x 746 / 83% EFF. = 4500
∴ 4360 < 4500. HEATING IS SAFE
1 2 3 4 5 6 7 8 9
RATIO I MAX./I MIN. OR W MAX./W MIN.

ROOT-MEAN-SQUARE LOADS CAN BE ESTIMATED CLOSELY FROM THESE CURVES

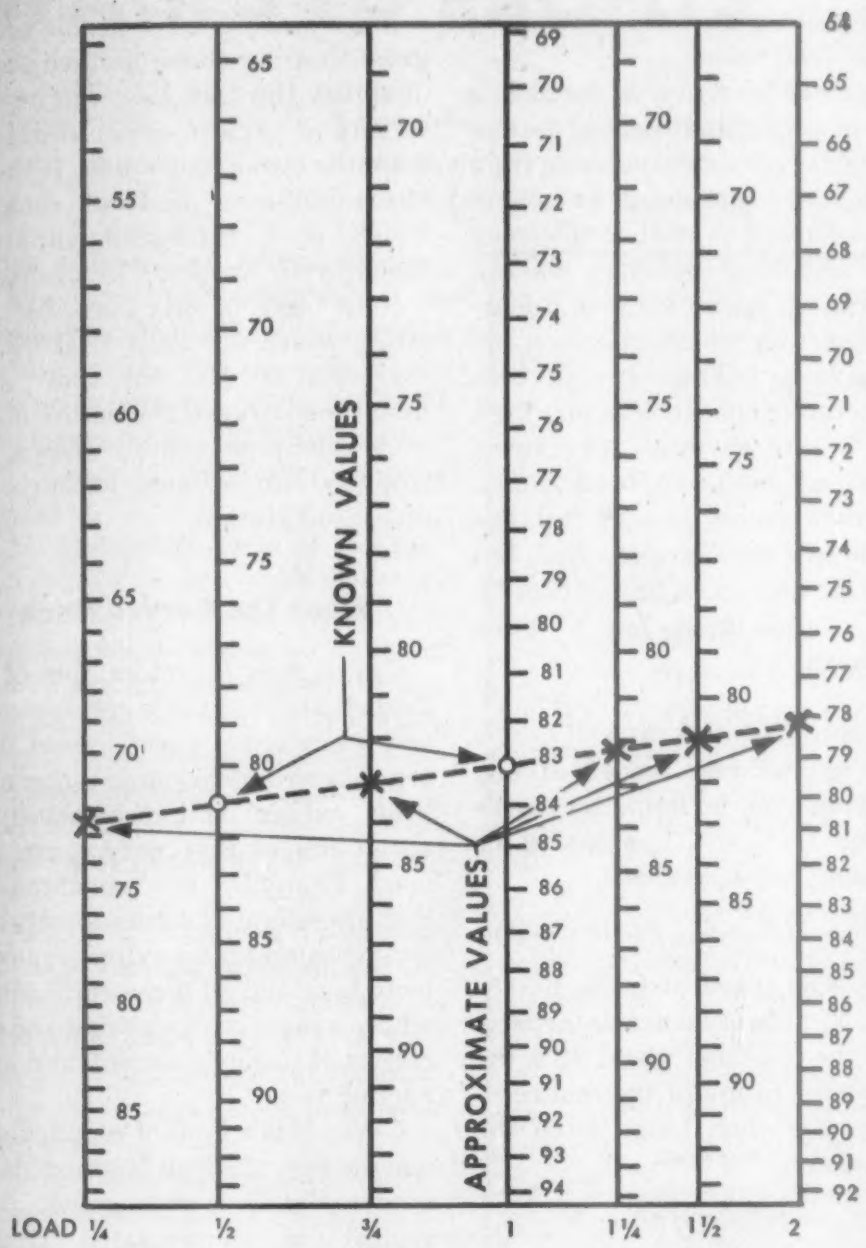
WHAT SIZES OF AC MOTORS FOR

A. F. LUKENS • INDUSTRIAL ENGINEERING DIVISIONS, LYNN RIVER WORKS, GENERAL ELECTRIC COMPANY

SOME applications involving pulsating loads of relatively low frequency have given trouble because of misapplication of the motors. Familiar examples are such things as water pumps and dinking presses.

The following rules and methods of checking such loads are approximate, but in general will assure that the motor is adequate for the job. These rules are applicable to single-phase and polyphase motors. They will not indicate whether the best type of motor is selected for an application, but will show that the motor selected will not fail from overload. In extreme cases, careful and lengthy calculation may show

MOTOR EFFICIENCY ESTIMATING CHART



TO DETERMINE MOTOR EFFICIENCY AT VARIOUS LOADS, DRAW A LINE THROUGH THE GUARANTEE POINTS INTO THE OVERLOAD RANGE

PULSATING LOADS

that a smaller motor could be used, but such a calculation usually is not worth making unless the application comes up frequently.

These rules are:

1. The rms. of the load should not exceed the service factor rating of the motor; that is, 115 per cent of full load for open and drip-proof motors, and 100 per cent for splash-proof, totally enclosed, and fan-cooled motors.

2. The maximum torque of the load should not exceed about 75 per cent of the full-voltage breakdown torque of the motor.

One or the other of these may be the limiting factor.

It is fairly obvious that the rms. load should not exceed the service-factor rating of the motor, since this is a measure of motor heating. In most applications it is sufficient to check the rms. current or watts input when the application is first tested.

The maximum torque limit of the load is arrived at by multiplying the breakdown torque at full voltage by 0.81 to allow for 10 per cent undervoltage, and by 0.9 to allow about a 10 per cent safety factor. At the extreme point of breakdown torque, the speed of a motor changes rapidly and the efficiency drops off very materially.

Thus for a motor with 300 per cent breakdown torque, such as a small special induction motor, the maximum load should not exceed 200 to 225 per cent of full load. For a single-phase motor with 180 per cent breakdown torque, the maximum peak of load torque should not exceed 135 per cent.

To Check Input

The best method of checking the maximum and minimum input to the motor is with a pointer-stop ammeter, or wattmeter. This type of ammeter has a stop actuated from the outside of the case that holds the needle in an elevated or depressed position. When measuring the peak value, the needle is raised by the stop until it just moves with the maximum value of the quantity under measurement. This procedure eliminates the inertia effects of the instrument itself, which if used on a pulsating load without pointer stop, may overshoot or undershoot and thus give an erroneous reading.

In like manner, minimum input is determined by depressing the needle until it just moves. If the cycle is slow enough, the pointer stop is not needed. However, since need for using the pointer stop depends on the characteristics of the meter as well as the load, the only sure way of finding out is by a comparison of readings with and without the stop.

Sometimes when current is being measured, care must be used to differentiate between the rms. peak

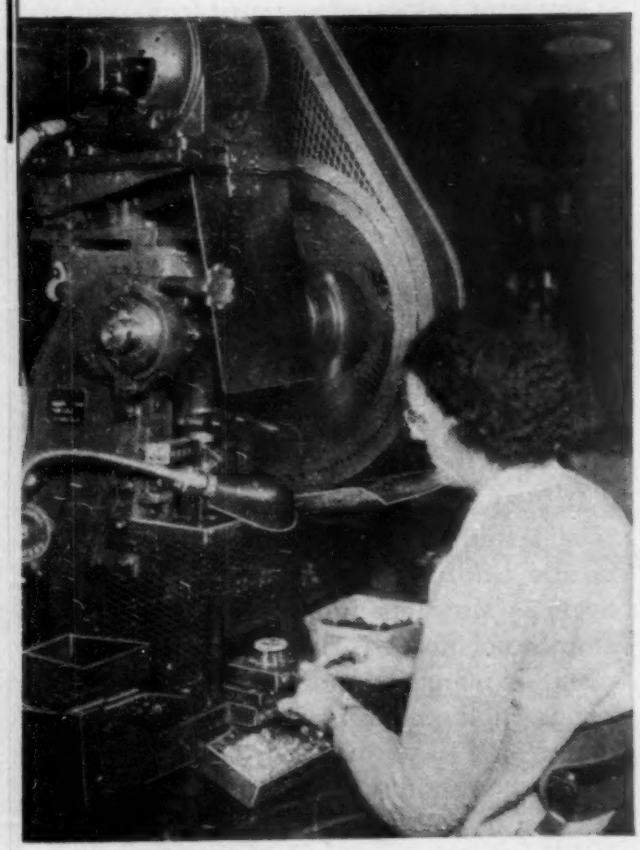
of the load and the peak of the 60-cycle current. The load peak, the desired value, is slower, while the 60-cycle peak is a mere flutter and should be disregarded. Watt measurements are not subject to this trouble.

Can Use Standard Meter

If a pointer-stop instrument is not available, any reasonably good standard meter can be used by removing the cover glass and holding the needle up with a penknife or some such instrument in order to indicate the maximum and minimum values. It is realized that standardization laboratories do not like to have the covers of their instruments removed, but it is often well worth while to break the seal in order to get these important data. Obviously, the instrument should be protected as much as possible to prevent the entrance of dirt.

Any type of instrument can be used, however, and the hook-on type often proves to be very convenient for field measurements.

With this information, make sure that the peak torque is not greater than 75 per cent of the breakdown torque of the motor. For relatively rough work, it is sufficiently accurate to assume that torque varies directly with amperes or input watts. For example, if a motor has 200 per cent breakdown torque, the maximum amperes or watts should not be greater than 150 per cent of the full-load value.



THIS SMALL riveting press, driven by a squirrel-cage induction motor, imposes a pulsating load that is typical of many other applications

If greater precision is desired, a curve of watts input against torque can be drawn by extrapolating from the standard guarantee values of full-load speed as well as efficiency at one-half, three-quarters, and full load. Shown (page 80) is an alignment chart on which efficiencies at various loads fall on a straight line. To determine efficiency at any load, draw a line through guarantee points and into overload range. Guarantee points should fall approximately on a straight line, but if they do not, use a line of best fit.

The watts input for a given horsepower is:

$$W_I = (746 \times Hp.) \div Eff.$$

The approximate speed at any horsepower can be found by extrapolating from the guaranteed or nameplate full-load speed.

$$N = N_o - [(N_o - N_{FL}) \times (Hp. \div R)]$$

Where N is speed at given horsepower, N_o is the synchronous speed, N_{FL} is the full-load speed, R is the horsepower rating of the motor.

Torque is then found from the expression:

$$T_Q = (5250 \times Hp.) \div N$$

From these values, a curve of watts input versus torque can be drawn, and the peak torque determined from the peak watts input to see that it does not exceed 75 per cent of the breakdown torque. Warning: *Such a calculated curve is not accurate beyond about 75 per cent of breakdown torque.*

The rms. load can be determined from an ammeter reading, if the pointer swing is not too great and the proper technique is used. The maximum and minimum of the free needle swing should be determined, usually by holding two pointers such as one's thumb nails on the glass to indicate the extremes. First one and then the other can be set. Then take a reading at a point that is halfway between the two. This is the approximate rms. value.

Do not average the maximum and minimum values, because that gives an erroneous quantity.

The rms. current should not exceed the allowed value for the motor under test.

If the swings of the needle are so great that the above method seems doubtful, the rms. load can be determined, again approximately, from the curve on page 81. It shows two conditions of load, each of which is a sinusoidal variation. Many cyclic loads can be evaluated on the basis of one curve or the other, which are arrived at by integration of the "squared" area under the curve. If the nature of the cycle is more accurately known, the rms. load can be found, of course, by direct integration.

What The Curves Mean

Curve *A* is representative of all loads that consist of a constant part and a sinusoidal variable part. It is typical of most crank-operated loads where counterbalances or something of that nature are not used. Examples are punchpresses that are operated continuously, uncompensated single-cylinder pumps, loom lays, and all those applications where a mass is accelerated and decelerated through a crank and connecting rod.

Curve *B* is a kind of rectified sine wave where the load is sinusoidal in nature but is compensated. It is typical of compensated single-cylinder pumps, multi-cylinder compressors and pumps, and similar equipment.

A third type of load, which is not shown, exists when a heavy flywheel driven by a motor has a load tripped onto the flywheel shaft. The flywheel is slowed down and delivers its energy to the machine. The load is then disconnected and the motor re-accelerates the flywheel. Such loads are typified by draw and dinking presses, when operated in this manner.

When the minimum value of watts found is less than the no-load watts of the motor, an indeterminate condition exists that is not covered by these curves. In this case, the rms. load lies between 61 and 71 per cent of the peak value, and should be taken as 71 per cent to be on the safe side.

REPORT TO EMPLOYEES TIES WAGES TO PROFITS

A. G. HEINSOHN, JR. • PRESIDENT, CHEROKEE TEXTILE MILLS
KNOXVILLE, TENN.

For a long time management at Cherokee has believed that its employees should know the status of its finances. For the past eleven years, therefore, it has issued to its employees an annual "Business Report" showing how the company has fared.

Accompanying view of the second page of the four-page leaflet for 1946 illustrates a simplicity of presentation which leaves no doubt in the employee's mind as to the apportionment of cost of materials, wages, depreciation, and taxes for every dollar taken in. And he sees exactly what was left from gross income for reinvestment and net profit.

On the third page of this report management has analyzed and interpreted the results. Among its comments are reminders to employees that "a successful company is one that makes a good profit year after year."

"A company making good profits," it continues, "is better able to maintain high wage rates, to install modern equipment, to pay dividends to the owners, and to build a surplus for future uncertainties."

The report points out that, as a result of favorable profits in 1946, three wage increases were made in that year. It voices the intention to keep the plant modernized for low-cost operation as the best insurance for stockholders, workers, and management against threats of lean years, because "the mill giving the best value" gets the preference in orders. When orders are scarce such preference, it reminds its workers, can spell the difference between full time or part time operations.

In 1945 the tenth annual report was presented in booklet form, to include a summary report of the previous ten years of operation in the same simple outline. This report reviewed at greater length past achievements, growth, present plans and objectives, and future outlook. Suggesting to the employees that "it would appear that our future will depend upon what we ourselves make it," it concluded that "if we can give our customers as much or more for their dollar than our competitors do, then we need not worry about the future."

What has been the reaction of employees to this practice? They now look forward to reading the annual report, and near the due date they begin asking for it. When the report is distributed, it is carried home; very rarely is one found on the floor or walks. One valid measure of its success in employee education of business economics has been the remark of not a few employees to the effect that this is the first mill they ever worked in that admitted it made any money.

ELEVENTH ANNUAL BUSINESS REPORT
YEAR 1946

	TOTAL DOLLARS	EACH DOLLAR
WE TOOK IN *(From our customers)*	**$4,241,684.06**	**100c**
WHICH WAS DIVIDED AS FOLLOWS:		
Cost of Raw Materials and Services *(Bought from others)*	1,248,407.47	29.4c
Cost of Wages and Salaries *(To Cherokee employees)*	1,804,288.40	42.6c
Cost of Machines and Mill Wearing out *(Depreciation)*	46,347.44	1.1c
Paid to Government *(Local, State, and Federal taxes)*	472,284.35	11.1c
Cash Dividends *(To owners of the mill)*	225,432.00	5.3c
Retained in Business *(For future needs and improvements)*	444,924.40	10.5c
Total	**$4,241,684.06**	**100c**

CHEROKEE'S REPORT to workers presents company financial statement in language anyone can understand. "As a result of our favorable profits in 1946," the company pointed out, "three wage increases were made during the year."

HOW TO MAINTAIN SPOTWELDERS

FRITZ ALBRECHT • SUPERVISOR, MANUFACTURING RESEARCH
THE GLENN L. MARTIN COMPANY, BALTIMORE

AVERAGE lost time of spotwelders at The Glenn L. Martin Company is considerably less than 8 minutes per machine per 8-hour shift. Spotwelding equipment costs from $3,000 to $37,000 per unit. Decreasing downtime enables a smaller number of machines to turn out a given amount of work. Hence there is ample incentive to see that this equipment gets good maintenance.

In this instance good maintenance means much more than merely keeping the equipment in operating condition. The metallurgical and physical requirements for critical aircraft components are exacting, and welds must meet the most rigid specifications.

Three types of spotwelding machines are used here: the condenser-discharge, the magnetic-stored-energy, and the a.c.-type machine, mostly in the form of press welders, with a few rocker arm designs. Seam welders are powered by both a.c. and condenser-discharge energy. In addition, the majority of steel and a few aluminum assemblies are jig-assembled by means of portable "poke" welders.

This equipment permits spot welding of aluminum alloys from 0.008 to 0.176 inch, and steel from 0.005 to ½ inch thick in various shapes ranging from an easily accessible wing-skin splice to an involved heating duct. These machines are used not only for welding secondary structures, but also for critical structural welds.

Shop Tests for Quality

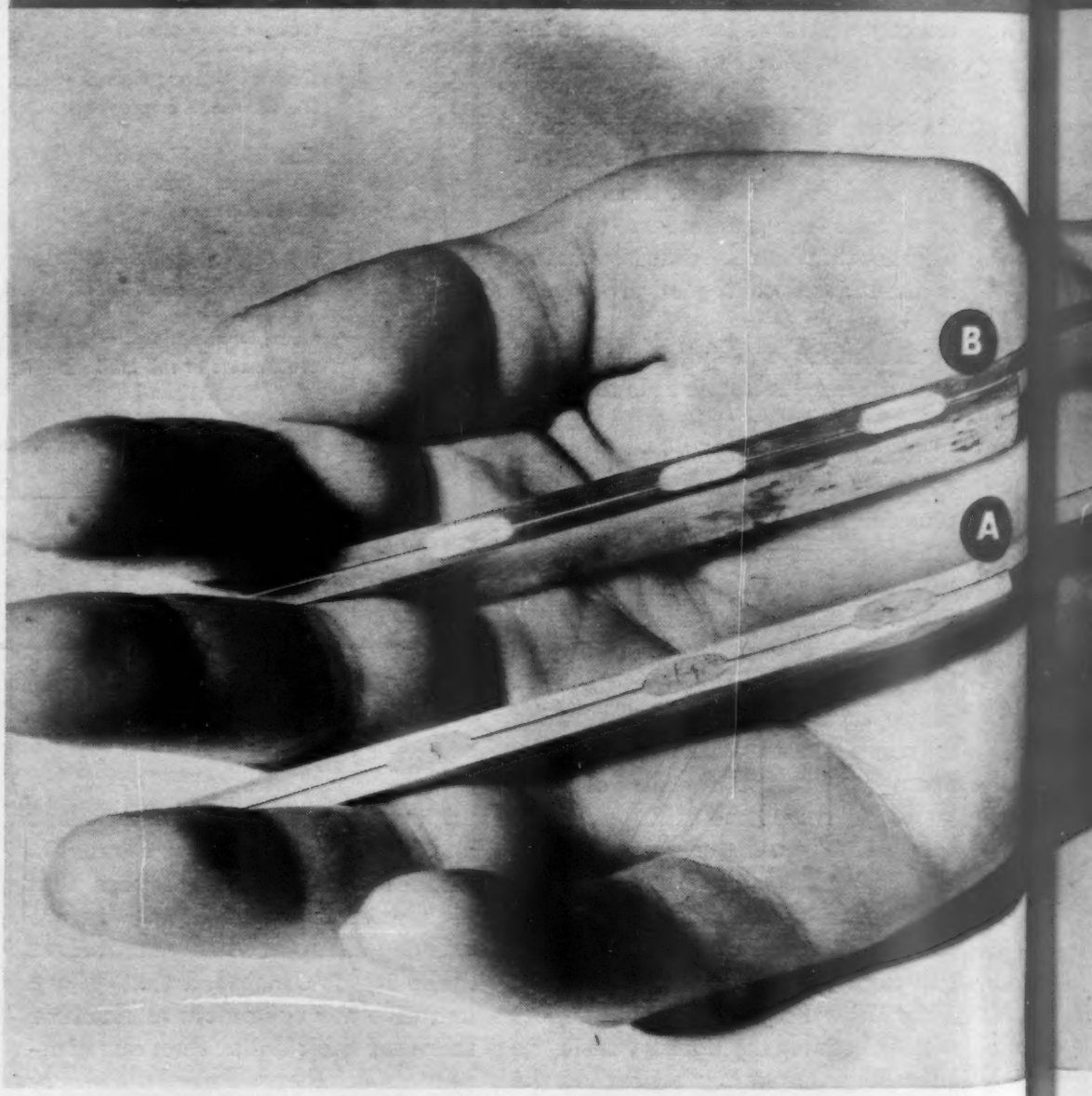
Certainty that welds meet the strength values demanded by the designer is assured only by maintaining the welding machines at the peak of mechanical and electrical performance. This performance level is set at the time of purchase and initial test. Methods of measuring the performance are applied throughout the production period. When a tendency to deviate from the prescribed performance level is shown by, for instance, sample coupons whose strength approaches the upper or lower limit of acceptability, the machine is checked at more frequent intervals.

If examination of the product or coupons by visual inspection, shear tests, and radiography discloses any welds that are not of acceptable quality, the inspector notifies the operator. Attempts to improve the welding are then made by the shop. All standard settings provide tolerances to permit necessary adjustments to compensate for variations in material.

Figure 1 illustrates the improvement possible purely by machine adjustment. The material is 0.187-in. aluminum-copper alloy (24ST Alc.). One standard sample, *A*, is severely cracked. Raising tip pressure about 4 per cent improved the weld with respect to cracking. Use of properly-shaped tips, replacing a worn pair, produced the welds that sample *B* shows.

Suitable macro-sectioning equipment is necessary for quick investigation of metallurgical qualities. With the equipment used here the specimen is cut by a water-cooled circular abrasive saw. The piece is

THREE TESTS TO DETERMINE QUALITY



1. MACRO-SECTIONS. These samples are made by cutting through a weld. Cracks in welds shown in sample *A* were eliminated, *B*, by replacing worn tips in the spotwelder and increasing the machine's tip pressure approximately 4 per cent

then rough-polished on a slow-speed alundum wheel, and fine-polished on a crocus cloth belt. Etching and washing follow this procedure.

In addition to metallurgical quality, the physical properties of welds also must be checked. Figure 2 indicates the shop procedure on relatively thin-gage material. Two ¾x4-in. strips of the same gages as in the assembly are spotwelded together and pried apart. This leaves the "buttons" shown. Some of the welds in Figure 2 were so inferior that no buttons were produced. However, the size, regularity of outline, and degree of variation of the sheared surface of button make possible a good estimate of machine performance.

If size varies more than the permissible 10 per cent of diameter, it can be expected that the shear values will vary more widely. Therefore five or more samples are checked on a precision testing machine. These samples are strips with only one spot, as shown in the shear test exhibit below.

The minimum shear value of any one sample, and the average of the five samples, must be above the Standard Single Spot and the Lowest Average value for the gages involved. If these attempts are unsuccessful for 15 minutes the machine is shut down, considered in Repair Status, and turned over to the welding engineer. A Machine Breakdown Report is filled out, giving machine number, date, time, and symptoms.

The welding engineer, or his staff in the shop, examines the defective work and determines whether the trouble is due to the machine setting standard developed by him for this particular type of work, or to malfunctioning of the machine.

In the case reported here the cracks were externally visible. Routine X-ray examination indicated defects shown in Figure 3. These defects are:

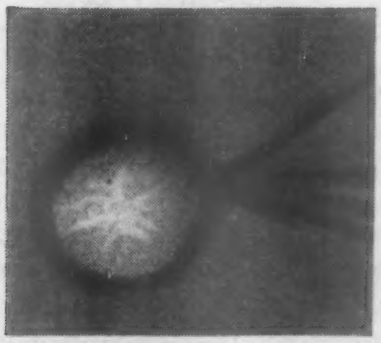
(1) Severe cracking, which indicates that the weld was made under insufficient pressure and/or that the forging was ineffective, due to lateness or insufficient pressure. Forging must take place immediately after weld formation, during the very short interval while the metal is plastic.

(2) Severe metal expulsion, which indicates either that cleaning was insufficient or that the pressure characteristics of the machine were such that it did not seal off the molten metal.

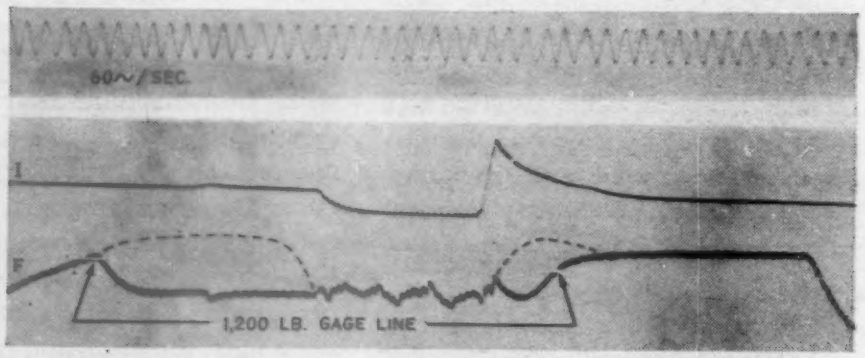
Of the two reasons for metal ex-

OF WELDS — AND ONE TEST TO CHECK MACHINE OPERATION

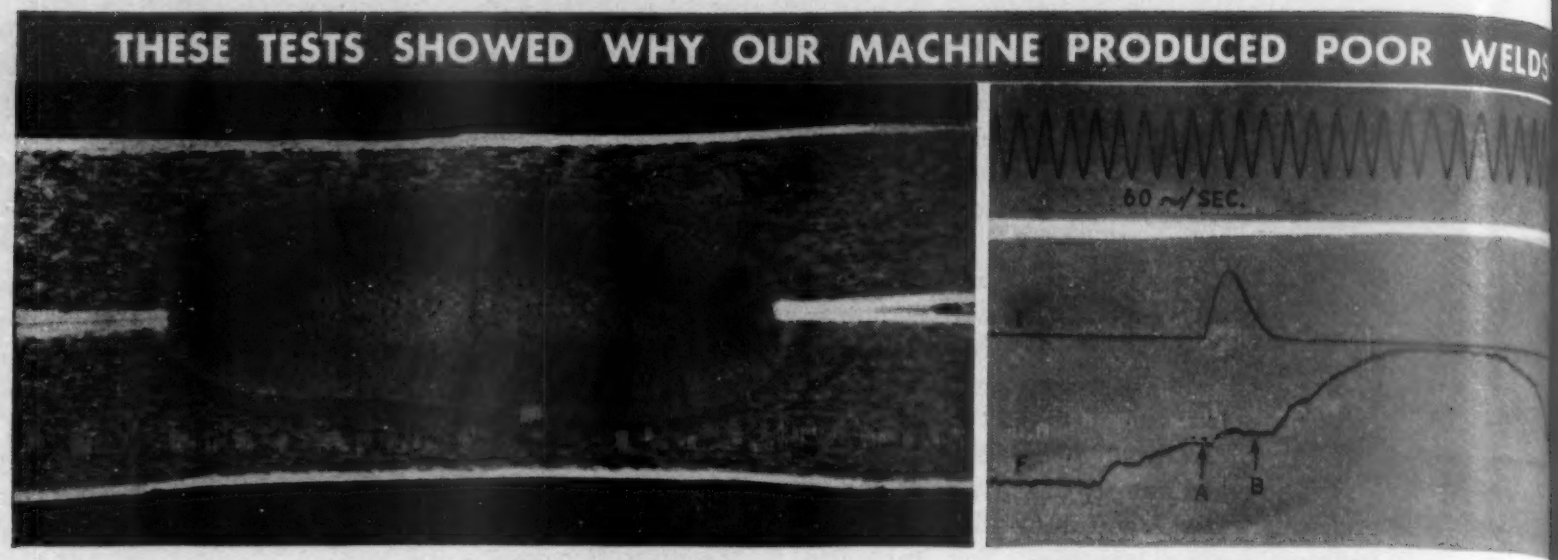
2. SHEAR TEST. Physical properties of welds are checked by welding together ¾x4-in. pieces of the same gages as the assembly, and breaking them apart for examination. Welds shown left in above photograph are defective. In some cases no buttons were formed. At right are samples made to determine machine acceptance



3. RADIOGRAPHS. This one shows cracks with spitting, or expulsion, of metal



4. OSCILLOGRAMS. These show graphically any irregularities in action of pressure mechanism, which in this instance is defective. Forging was reached only after complete cooling of weld slug



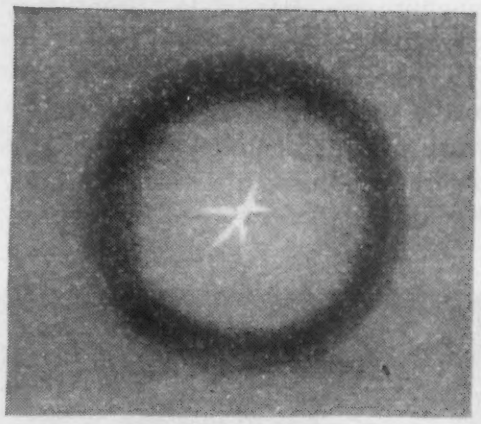
5. A MACRO-SECTION OF A WELD SHOWED SEVERE CRACKING

6. PRESSURE MECHANISM IS FAULTY

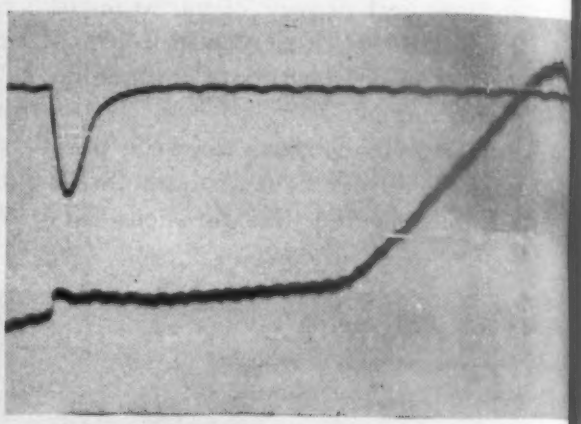
pulsion, quality of surface cleaning can be ascertained by surface-resistance measurement. A device is used that passes current through two representative sheets, or an actual assembly. The action is generally analogous to the welding action of a spotwelder, involving the application of a standard pressure by carefully shaped and controlled electrodes, and passage of current between the electrodes through the specimen.

The resistance that current meets in passing from one sheet surface into the other is a function of the amount of surface oxidation and the roughness of the surface. Chemical cleaning does not remove all oxides, and even cold-rolled sheet has some surface irregularities; hence some resistance to current flow is always present. The resistance is read on a meter indicating directly in microohms. Resistance up to 160 microohms can be tolerated but, generally speaking, poor welding conditions result above this figure.

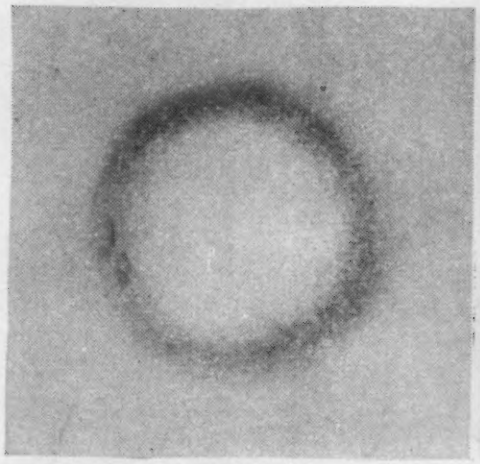
If the chemical cleaning appears sufficient, other obvious causes of poor welds are checked, such as proper electrode material and electrode shape, looseness of machine components, and proper pressure-gage indications. This usually is a joint endeavor by shop and welding engineer personnel and, incidentally, provides opportunity for personnel education.



7. WELDS STILL HAD CRACKS



8. FORGING PRESSURE TOO LATE



9. RADIOGRAPH SHOWS GOOD WELD

10. NO DEFECTS IN MACRO-SECTION

Oscillographic Check

Assuming that the sample indicates a resistance well below a critical figure, and that no other causes have been uncovered, the next step is to check the characteristics of the pressure mechanism by oscillographic means.

The type of information furnished by this check is shown in Figure 4. It clearly illustrates the trouble with the machine. For example, current curve *I* shows normal behavior, as judged by standard curves known to have produced good welds. The pressure curve *F*, however, is definitely erratic. The precompression (first peak) is of very short duration and hardly rises above 1200 pounds.

Short duration of the precompression cycle explains the "spitting." At the start, current flows between the sheets by way of surface irregularities. Precompression prior to current flow irons out irregularities which, due to the small contact area, would be unable to carry the heavy weld current at the beginning. If pressure of insufficient and/or short duration is applied, volatilization of the ridges occurs at the start of current flow. The gas pressure will then expel the molten metal.

After the incidence of weld current the pressure curve should have risen immediately to 1500 pounds. Instead, it dropped off and rose to

forging value only after complete cooling of the weld slug. Cooling under low pressure will cause cracking of the cast nugget, and forging after complete cooling is ineffective.

Report in Triplicate

After locating the defects, the welding engineer turns the machine over to the maintenance department for repair, together with the Machine Breakdown Report, giving the information gleaned from the preceding examination. This form is filled out in triplicate, one copy each going to spotweld supervisor, welding engineer, and maintenance department.

In this instance repair of the air-pressure electrode valve produced spotwelds that were acceptable. An oscillographic recheck produced a curve essentially the same as the dotted portion of Figure 4.

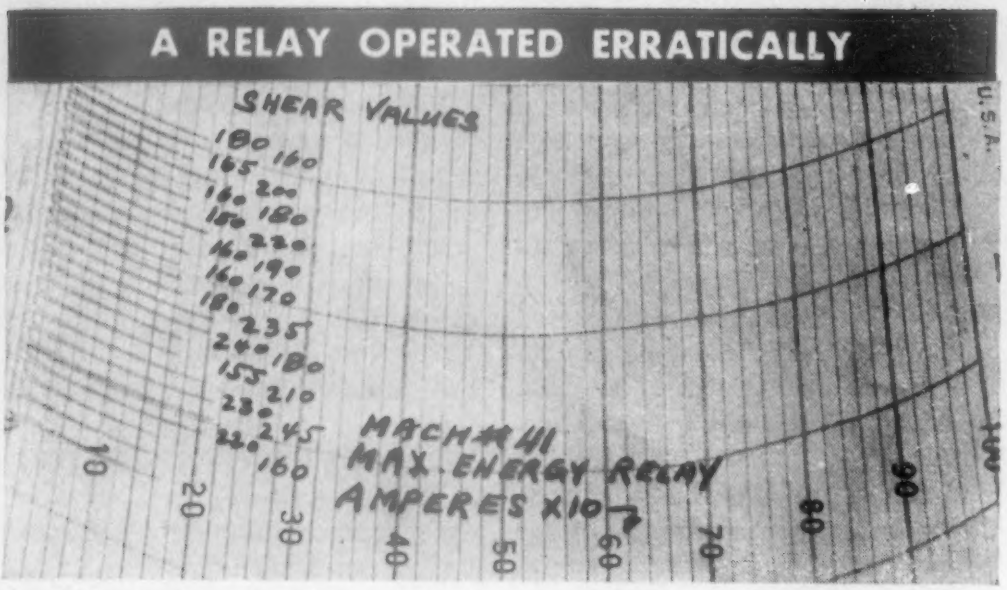
After repairs have been made, the machine is turned over to the welding engineer for acceptance, which will be on the basis of X-rays, determining the metallurgical quality of the welds, and the shear values of test coupons. These coupons determine not only the average strength, but the uniformity of performance over, say, 25 consecutive spots.

On the degree to which the strength of individual spots differs from the average in this relatively small sample, a sound prediction can be made as to whether a machine will produce spotwelds whose shear values are within acceptable limits.

The arithmetical work of this statistical solution is reduced to a matter of seconds by the use of tables.

If the welds are acceptable, the Machine Breakdown Report is filled out by entering the repair made, counter reading, production time lost, machine on standard (Yes or No), and cleared out by the signatures of the welding engineer and shop personnel before production is resumed.

Shop personnel remove the machine from Repair Status by making 15 single-spot shears under inspection surveillance. Peel and macro-samples also may be made.



11. A RECORDING AMMETER showed erratic operation of the relay of a magnetic-stored-energy welder. Shear values of the welder are shown opposite the current peaks

The minimum and averages so obtained must meet standard values before Quality Control will accept production from this machine. Such acceptance samples are illustrated in Figure 2 *B*. Note the uniform size of the buttons in the five-spot sample. This latter sample is retained. Another five-spot Production Control sample made in, say, ½ hour must show substantially no change in button size.

Close Quality Control

On occasion, button size begins to vary after a short time. This gives the operator warning that the machine is drifting away from established button-size standards. Usually it can safely be assumed in such cases that only one adjustment is changing. Assuming a gradual increase in spot size, there may be either an upward creep of current value, or a gradual decrease of pressure. Adjustments can be made, within definite limits, by the shop, under Inspection Control.

Change in spot size in either direction is undesirable. Weaker spots obviously are dangerous. Larger spots, resulting from change of only one constant, are poor metallurgically although the static shear values may be quite high. The assumption that their higher strength makes for better assemblies is not valid if the deleterious effects of metallurgical imperfections are considered. The cracks and voids usually existing in unsound nuggets give rise to poor fatigue performance, very likely initiating failure by progressive cracking rather than plain static shear failure.

Case Study No. 1

On another occasion a condenser-discharge-type machine gave erratic shear results. External appearance of the welds yielded no clues. However, radiographs revealed a condition resembling that in Figure 3, but of much smaller magnitude. Metallurgical specimens showed unacceptable cracking and spitting, as in Figure 5. The oscillographic unit gave the curves in Figure 6, which indicated serious pressure trouble.

The pressure curve *F* shows that at *A* the pressure mechanism failed to continue the rise it had maintained up to that point. When the weld current *I* softened the metal, its reaction to the pressure of the electrode was seriously reduced. In effect, the electrode lost its ability for an instant to exert pressure on the metal because of softening in the area under the electrode.

Even a relatively small decrease is very harmful, because weld formation under low pressure produces blowholes, due to unrestricted gas formation. Some of the liquid weld metal, under high pressure due to thermal expansion and, occasionally, gas formation, is permitted to escape. This is due to failure to seal the liquid metal within the nugget area. Since upon cooling insufficient melt is available, voids develop,

which the forging pressure is unable to decrease materially.

Voids offer starting points for cracks, while the loss of material increases the cracking tendency. Poor follow-up and lack of weld pressure invariably combine to make for spits and cracks as in Figure 3.

From Figure 6 it can be assumed that the cracking must be due to insufficient pressure at *A* and the inability to maintain the pressure, because of mechanical friction and/or restriction of the air supply. This assumption is supported by the shape of the recompression curve, which should have reached 90 per cent of maximum at time *B*.

The machine was overhauled mechanically, and another sample tested radiographically indicated much improvement. Spits no longer occurred. However, the cracks shown in Figure 7 still existed. Another oscillographic test gave results shown in Figure 8. Obviously the forge pressure incidence was entirely too late. This was found to be due to a defect in the electronic timer of the forge pressure-air valve. Note, however, the satisfactorily sharp rise in pressure in general and especially at the instant of current flow. The cause of this peak is as follows:

As the spherical tips penetrated about 0.003 inch into the softened metal, their periphery came up against the still-hard metal surrounding the soft center of the spot. This movement must be accomplished in about 1/250 second, and stopping of the travel of the electrode is rather abrupt. It caused a slight impact shown as a transient rise in pressure that is indicative of perfect electrode follow-up, proving the excellent mechanical condition of the machine.

Repair of the forge pressure timer advanced forge incidence to start 1/120 second after the weld-current peak. Hence, the forging pressure is exerted at the time of solidification.

In general, a spotwelder having the correct follow-up will not form any, or only minutely, cracked spots during the welding period, prior to application of forge pressure. Very small cracks are completely closed without difficulty by the forge pressure. Semi-cold working of the cast nugget is necessary, however, because forging improves ductility and increases fatigue strength.

Proof that this machine was now in good condition is found in the excellent quality of welds shown by the radiograph in Figure 9, and the macro-section, Figure 10, which were obtained as a check on machine performance.

The foregoing examples illustrate the principles behind spotwelder maintenance. They should not be taken as indicative of the complexity of all spotwelder problems. Not every service call, nor even the majority, require engineering assistance and oscillographic checks. Some instrumentation, however, is required in most cases.

Case Study No. 2

An instance of trouble more nearly representative of average complexity is as follows:

A magnetic-stored-energy machine became unreliable with respect to spot strength. In these machines, three-phase rectified current at about 150 volts builds up magnetic energy in an inductor. A maximum-energy relay, which is current-sensitive and adjustable over a range of 50 to 400 amperes, trips when a certain current value is reached. Upon tripping it causes several contactors in the highly inductive d.c. circuit to open. The contactors are timed in cascade so that each absorbs an equal share of the resultant arc.

If there is failure to produce welds within acceptable shear-value variation, this relay is suspected of operating erratically. It is checked by connecting up a recording ammeter and making sample welds. Varying heights of the current peaks shown in Figure 11 showed that the relay did operate erratically, resulting in the shear values marked at each peak. After cleaning and freeing the relay armature, the shear values were still somewhat erratic.

Visually checking the breaker points showed one point taking most of the arc. On removing the arc shield the contact was found to be so badly burned that replacement of the shoe was necessary. Both old and new contacts are shown in Figure 11. After timing the contacts visually, the machine performed well within tolerance.

All our welding machines are equipped with counters, which register the number of spotwelds produced. A reading is taken daily. From these readings preventive maintenance can be scheduled, based on production.

Log Book Kept

Spotweld Maintenance also keeps a special log book in which the regular preventive maintenance work is scheduled. The scope of this article does not permit full discussion of this subject.

In general, however, the regularly scheduled work covers: cleaning transformer secondary; cleaning foot switches and control cabinets; adjusting relays; cleaning and checking welding transformers for defects; recalibrating pressure gages; checking all water and air connections and hoses.

The maintenance men who work on spotwelding machines have been given extensive training, usually by the welding engineer.

These men were drawn from the plant electrical maintenance department. Instruction was given in two types of classes. One was a round table session. In another class, the engineer explained functioning of circuits, breakdown symptoms, and repair procedure in lecture style, with a question period.

The maintenance men also took the courses given to spotwelder operators, to familiarize themselves with the operational aspects of welding. This training enables a maintenance man to distinguish between real trouble and merely operator trouble.

Finally, the maintenance men must know what performance tolerances are. All performance requirements set by the welding engineer and enforced by Quality Control are communicated to maintenance.

The educational aspect then, as concerns maintenance personnel, may be summed up by saying that training is being done in all aspects of welding: primarily in maintenance; secondarily in operating a machine; and to a lesser degree, in product knowledge.

MAIL AND KEY MESSAGES ARE SPECIAL-DELIVERED BY PNEUMATIC TUBE THROUGHOUT THE MILE-LONG PACKARD PLANT

MAIL GOES FASTER, AT LOWER COST BY PNEUMATIC TUBE

PROBLEM: To deliver telegrams, rush mail, confidential inter-plant messages, blueprints, production change data, and other vital information through the Packard Motor Company's mile-long Detroit plant, at high speed and low cost. Previously done by messengers on foot, process was slow and costly.

SOLUTION: Pneumatic-tube system now carries all urgent mail, messages, and other materials ten times faster than a messenger could. Messages are routed to each major department from a centrally-located tube station.

SAVINGS: Messenger force, now reduced by one-half, carries twice the amount of regular mail previously carried. High-speed service helps eliminate production tie-ups. Messages and papers placed in the tube carriers arrive in better condition at greatly reduced cost. From 5 to 30 minutes of messenger time is now saved on each message.

MAIL ARRIVES seconds after sending. Foam rubber pad in box below tube absorbs shock as cartridge is expelled

FACTORY'S
FOURTH ANNUAL SURVEY
OF
WORKER OPINION

WHAT THE FACTORY WORKER REALLY THINKS

ABOUT THE TAFT-HARTLEY LAW AND LABOR IN POLITICS

MISUNDERSTANDINGS about the Taft-Hartley Act have placed a heavy strain on human relations in industry. To ease that strain, it is necessary to understand the worker's aims, desires, and beliefs. In "Workers Speak Their Minds About Labor-Law Changes" (June, 1947) FACTORY analyzed worker reaction to the provisions of the then pending Taft and Hartley Bills. Now FACTORY reports a national study of worker reaction to the Taft-Hartley Act—and probable political consequences. It is the first such study made since the law has had time to make itself felt.

This new survey reveals one fact of prime importance to management: *There is strong worker objection to the Taft-Hartley Act.* But knowledge and understanding can change worker opinion.

●

This article is the first of two based on FACTORY's fourth annual survey of "What the Factory Worker Really Thinks." The survey was conducted for FACTORY by the McGraw-Hill Research Department, making use of the most modern sampling techniques to determine group opinion. Interviews were made in every part of the United States. Accuracy of this new poll was insured by allotting interviews in proportion to geographical concentration of manufacturing workers, type of industry, size of plant, union membership, age group, and sex. FACTORY believes the survey is representative of current opinion of non-supervisory factory employees throughout the nation. This continuing service is presented in the interest of greater understanding between management and labor, and hence of greater industrial efficiency and national prosperity.

SUMMARY OF WORKER OPINION

TAFT-HARTLEY LAW

1 Most workers admit they know little or nothing about the Taft-Hartley law... but a majority say they want changes or repeal... even though they have few specific criticisms

2 As yet only one worker in ten has been affected by the Taft-Hartley law... but one in three expects to be worse off under this new law

3 Workers do not expect the Taft-Hartley law to be the chief cause of strikes in 1948... nor do they expect as many strikes as in 1947

LABOR IN POLITICS

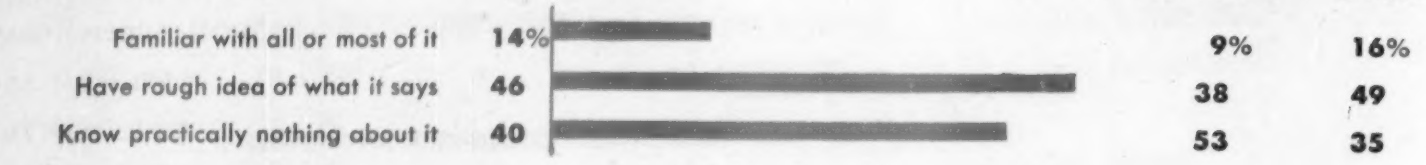
4 Political activity by unions is gaining worker acceptance... but workers don't approve of using union funds to support such activity

5 Only one out of five workers sees organized labor as having too much influence on the Truman Administration... but three out of five would disapprove of a "labor party" government in America... nationalization doesn't appear as attractive as it did two years ago

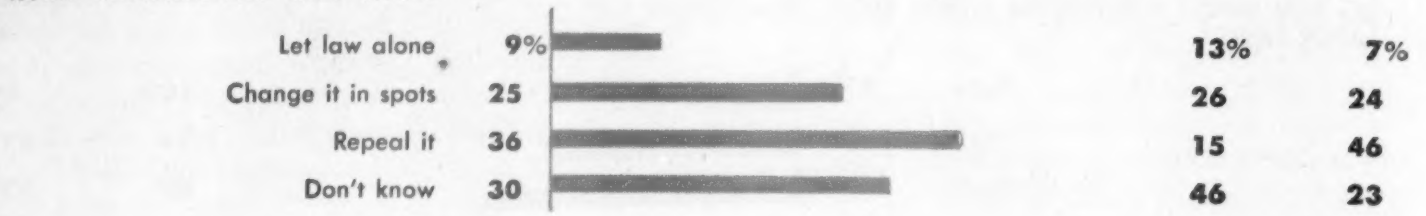
6 Workers are definitely undecided as to what political leader is the "best friend" of labor

7 One out of five workers would switch his vote, if necessary, to support a union-endorsed candidate... but so far Senators who backed the Taft-Hartley law have lost only 3 per cent of the worker votes they had when elected

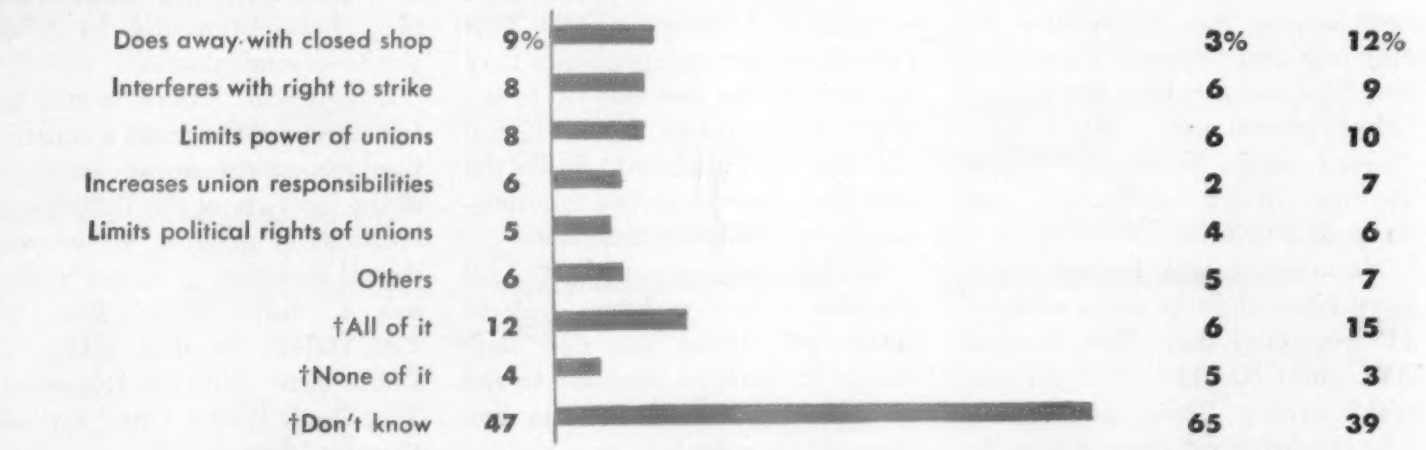
Most workers admit they know little or nothing about the Taft-Hartley law...



...but a majority say they want changes or repeal...



...even though they have few specific criticisms



★ All answers were volunteered (i.e., respondents were not offered a choice of possible replies). Figures total more than 100 per cent because some respondents named more than one criticism. † These respondents refused to cite specific criticisms

● AFL and CIO campaigns to propagandize members about the law have made a ripple, but not a splash. Union workers claim to know more about the law than do non-members, but independents' members register about the same awareness as AFL and CIO.

Even among union members, 57 per cent could not name a single specific criticism of the Act. Members of independent unions were most worried about the ban on the closed shop—21 per cent of them named it, compared with 11 per cent each in AFL and CIO. Similarly, 21 per cent of all workers in the West* mentioned the closed shop. In no other section was the figure above 10 per cent; in the South it was only 3.

It should come as no surprise to FACTORY's readers that only a small percentage of workers find things to criticize in the Taft-Hartley Act. In June, 1947, FACTORY queried workers on what they thought about the 28 key points in the Senate and House bills. Later surveys by other groups have corroborated FACTORY's finding that a preponderance of workers favored virtually every provision included in the Act as it was finally passed.

***GEOGRAPHICAL SECTIONS BY STATES ARE AS FOLLOWS:**

NEW ENGLAND—Conn., Me., Mass., N. H., R. I., Vt.
MIDDLE ATLANTIC—N. Y., N. J., Pa.
EAST-NORTH-CENTRAL—Ill., Ind., Mich., Ohio, Wis.
SOUTH—Ala., Ark., Del., Fla., Ga., Ky., La., Md., Miss., N. C., Okla., S. C., Tenn., Tex., Va., W. Va.
WEST—Ariz., Calif., Colo., Iowa, Idaho, Kan., Minn., Mo., Mont., Neb., N. D., N. M., Nev., Ore., S. D., Utah, Wyo., Wash.

CONTINUED ON NEXT PAGE

2 As yet only one worker in ten has been affected by the Taft-Hartley law . . .

HAS THE NEW LAW DIRECTLY AFFECTED YOU?

. . . but one in three expects to be worse off under this new law

DO YOU EXPECT A BETTER OR WORSE BREAK THAN UNDER THE OLD LABOR LAWS?

● Of those who said they had been directly affected by the new labor law, FACTORY asked: *How?* Few answers were specific, and even among the generalities the only one that recurred frequently was "the company has got tough." Other mentions: "pay cuts," "forced union to strike," "made striking more difficult," and "morale down."

Members of independent unions have been slightly more affected (18 per cent) than have those of AFL and CIO (13 and 12 per cent respectively). These people also take the brightest view of how the law will affect them in the future; 13 per cent expect to be "better off;" 40 per cent foresee no difference; and only 32 per cent look forward to a "worse break." This attitude of the independents may result from the fact that up to the time of the survey the AFL and CIO had not "qualified" under the new law, thereby giving the independents a distinct advantage.

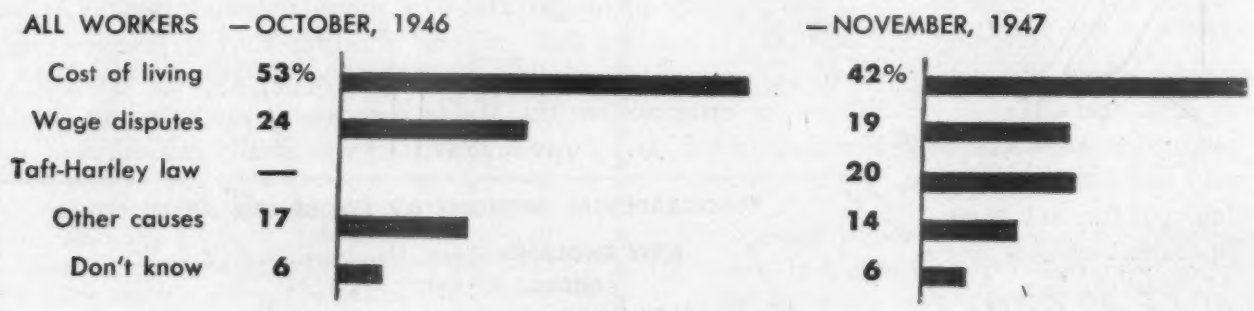
The fact that an even half of *all* workers expect to be as well or better off under the new law stands in marked contrast to the 61 per cent who want the law changed or repealed.

The replies to these two questions add up to one thing: *most workers still base their opinions of the Taft-Hartley Act on what they have been told by propaganda-crazed unions.*

Conclusion: There is still time for management to do a constructive job of informing employees of the facts about the Taft-Hartley Act and of proving, by example, that it is neither a "union busting" nor a "slave labor" law. (See FACTORY, October, 1947, "The Labor Law Will Be Repealed If You Don't Watch Out," for additional information.)

3 Workers do not expect the Taft-Hartley law to be the chief cause of strikes in 1948 . . .

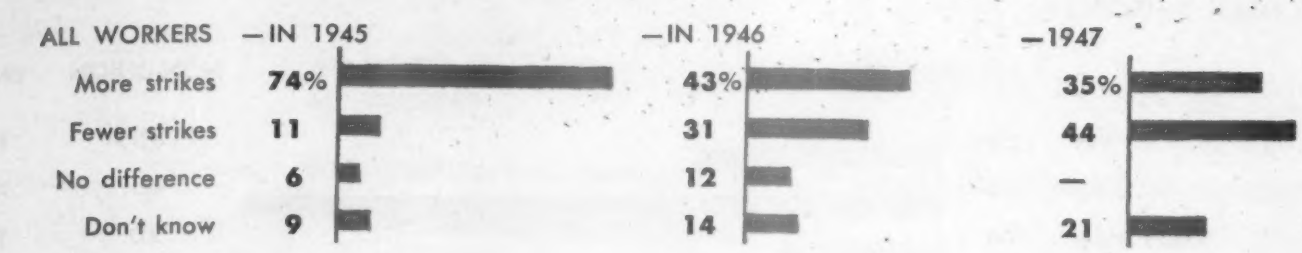
WHAT WILL BE THE PRINCIPAL CAUSES OF STRIKES IN THE YEAR AHEAD?★


ALL WORKERS —OCTOBER, 1946 —NOVEMBER, 1947
Cost of living 53% 42%
Wage disputes 24 19
Taft-Hartley law — 20
Other causes 17 14
Don't know 6 6

★All replies were volunteered (i.e., respondents were not offered a choice of possible replies). Figures total more than 100 per cent because some respondents gave more than one reply

...nor do they expect as many strikes as in 1947

DO YOU EXPECT MORE OR FEWER STRIKES IN THE YEAR AHEAD?



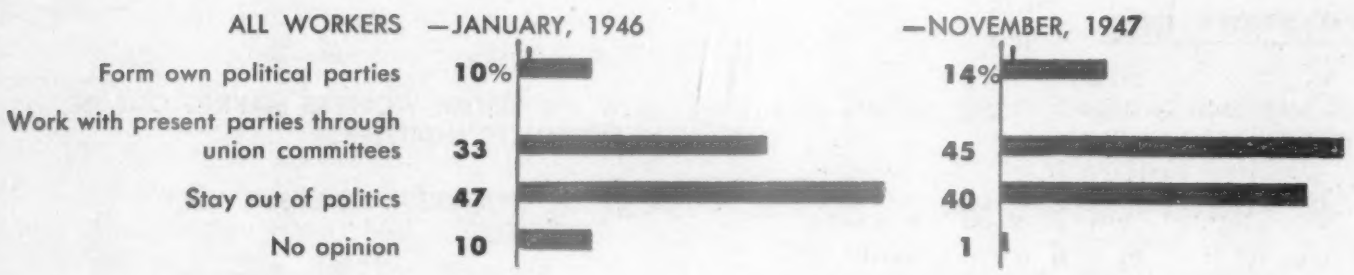
● Wage adjustments in the past year have somewhat eased the pressure of living costs, but, as workers see it, this still figures to be the prime strike cause in 1948.

Union and non-union workers differ little in their opinions of strike causes, except on the question of the Taft-Hartley Act. Twenty-four per cent of union members foresee the law as a principal cause of strikes; only 10 per cent of non-union workers take that view. In the Middle Atlantic states and less-unionized South, 15 and 14 per cent, respectively, were "Taft-Hartley minded," compared with 25, 24, and 25 per cent in the West, East-North-Central, and New England regions.

Optimism concerning the general strike picture continues to grow for the third successive year, with a slight plurality of workers now feeling that there are fewer, rather than more, strikes ahead. And there is nothing "spotty" about that optimism. There are no significant variations between union and non-union workers, or by geographical region, plant size, and age group. •

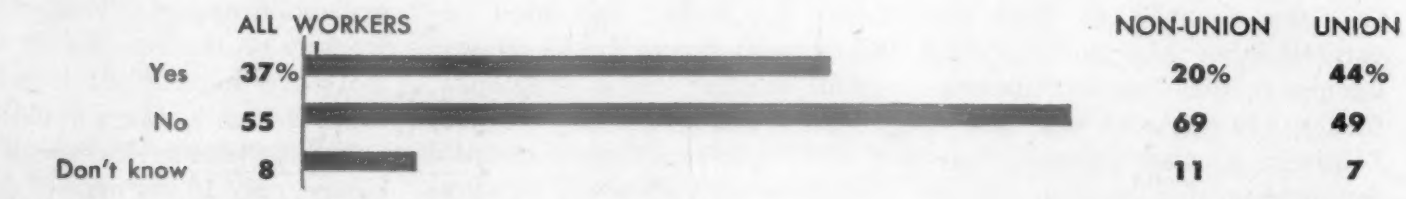
Political activity by unions is gaining worker acceptance...

WHICH OF THESE THINGS DO YOU THINK LABOR UNIONS IN THIS COUNTRY SHOULD DO?



...but workers don't approve of using union funds to support such activity

DO YOU APPROVE USE OF UNION FUNDS FOR POLITICAL ACTIVITY?



● Sentiment for union-sponsored political parties is strongest among members of CIO unions, with 21 per cent favoring this type of action. AFL and independent union members are still less enthusiastic on this issue; votes of 14 and 13 per cent, respectively, do not differ significantly from the average for all workers. Among non-union workers there is a clear majority, 57 per cent, who feel that unions should "stay out of politics."

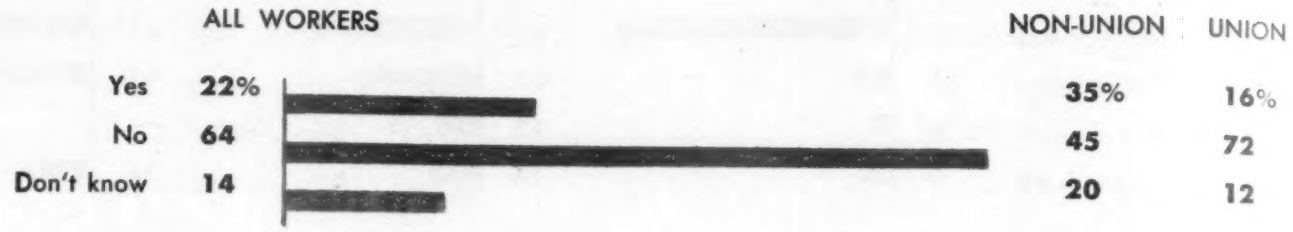
But even among CIO members less than a majority, 46 per cent, feel that unions should use their funds to support political activity. Regionally, New Englanders voice the greatest acceptance (45 per cent) of this proposition; Southerners are loudest in opposition: 62 per cent say "no."

And the political assessment voted by the AFL convention was against the wishes of the 51 per cent of AFL members who voted against such use of union funds.

CONTINUED ON NEXT PAGE

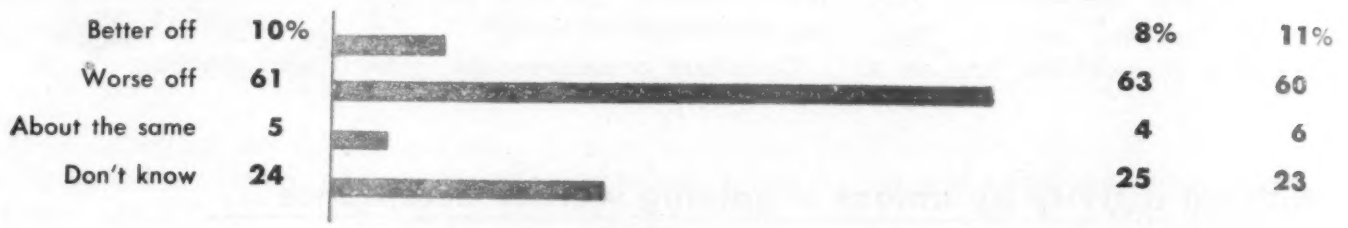
5 Only one out of five workers sees organized labor as having too much influence on the Truman Administration...

TOO MUCH INFLUENCE?



...but three out of five would disapprove of a "labor party" government in America...

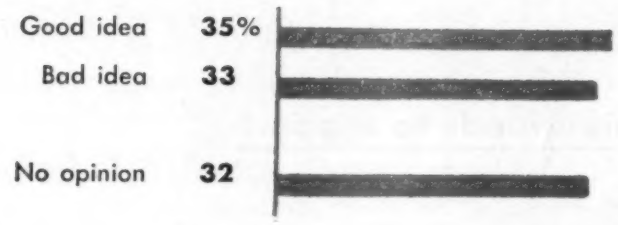
HOW WORKERS THINK THEY WOULD FARE UNDER A "LABOR" GOVERNMENT



...nationalization doesn't appear as attractive as it did two years ago

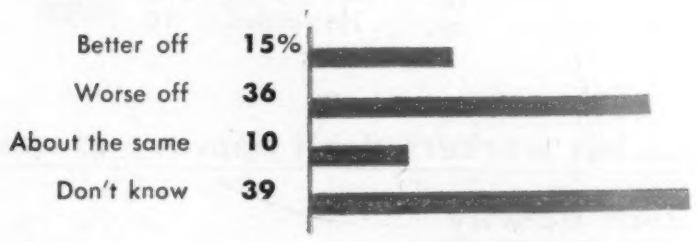
IS NATIONALIZATION A GOOD OR BAD IDEA FOR THE BRITISH PEOPLE?

ALL WORKERS — JANUARY, 1946



HOW ARE BRITISH WORKERS MAKING OUT IN NATIONALIZED INDUSTRIES?

ALL WORKERS — NOVEMBER, 1947



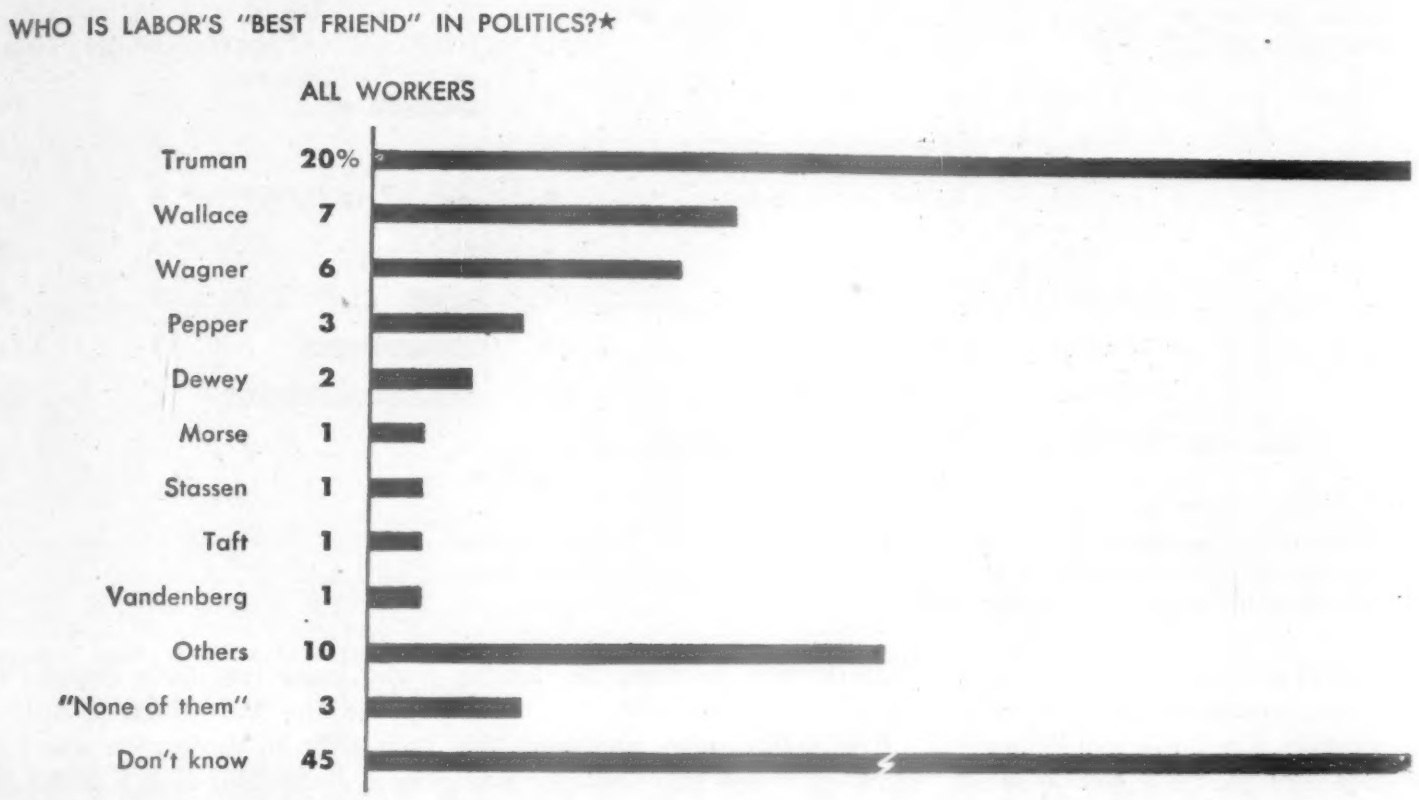
● Workers in the western states are least inclined to think organized labor has too much influence on the Truman Administration (16 per cent say "yes"); Southern workers are most conservative on this question (27 per cent "yes"). Contrast of union and non-union replies reveals the greatest divergence of opinion concerning organized labor's influence on the national government.

The most significant point about workers' rejection of the idea of a labor party government in America is the *lack* of any real variation among different classifications. FACTORY tabulated returns to its survey by 18 groups: union, 4; plant size, 4; geography, 5; age, 3; and sex, 2.

Of *all* workers, 61 per cent said they believed they would be worse off under a labor government. *None of the 18 worker groups varied by more than 7 per cent from that average.* The low was 54 per cent among workers in plants of 251-500 employees. The high was recorded in the South: 66 per cent of workers there reject the idea of a "labor" government.

The British experiment in socialization apparently hasn't sold workers on the idea that it would work over here. While 15 per cent think British workers in nationalized industries are better off than before, only 10 per cent of American workers think they would be better off under a labor government. And that 15 per cent stands out in marked contrast to the 35 per cent who, in January, 1946, thought that nationalization of basic industries under the labor government would be a good idea for the British people.

6 Workers are definitely undecided as to what political leader is the best friend of labor



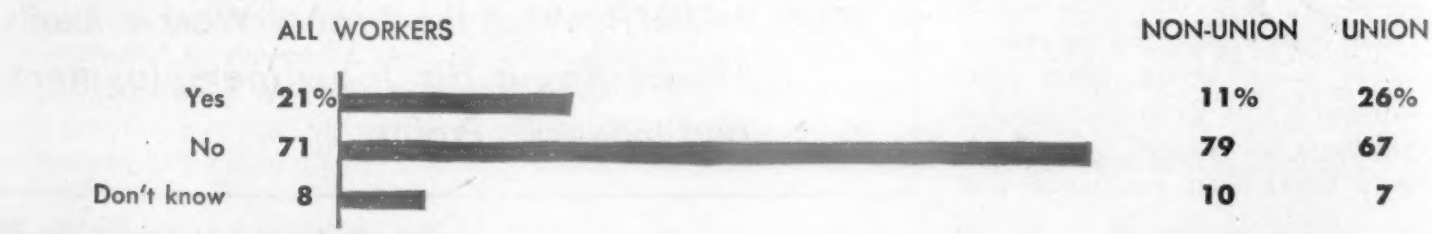
★ All answers were volunteered (i.e., respondents were not offered a choice of possible replies)

● Despite the fact that President Truman is the heir of Roosevelt's pro-labor New Deal, and that he has continued those policies in his vetoes of the Case and Taft-Hartley Bills, only 20 per cent of workers consider him their "best friend in politics." The poll was taken soon after Henry Wallace concluded his nationwide speaking tour—largely addressing labor rallies—and his name was fresh in the minds of workers. Yet he ran a poor second with a mere 7 per cent of the votes. Wagner, whose name is synonymous with what labor calls its *"magna carta,"* polled but 6 per cent. The flat reply, "none of them," ran fourth, tied with Senator Pepper, arch-foe of the Taft-Hartley Act. "Others" included a sprinkling of votes for Senators and Representatives, but for the most part was made up of state and local politicians – and a few mentions of the late President Franklin D. Roosevelt.

Regional patterns were strong. Truman received 26 per cent in New England, compared with only 15 per cent in the Middle Atlantic states. But Wagner also got 15 per cent in this area, possibly by "taking" votes from Truman. Democrats Pepper and Truman dropped below average in the Democratic South, with 2 per cent and 16 per cent, respectively.

The significant point is that a whopping 45 per cent don't know *who* their friends are. In terms of election-year politics, this means that workers are "shopping around," that anything can happen. Nobody is the "best friend of labor." Nobody is going to carry the "labor vote" on the basis of past performance.

7 One out of every five workers would switch his vote, if necessary, to support a union-endorsed candidate...



CONTINUED ON NEXT PAGE

...but so far Senators who backed the Taft-Hartley law have lost only 3 per cent of the worker votes they had when elected

(A) HOW DID YOU VOTE WHEN SENATOR ★ WAS LAST UP FOR ELECTION?	(B) HOW WOULD YOU VOTE IF SENATOR ★ WERE UP FOR ELECTION TODAY?	ALL WORKERS	NON-UNION	UNION
For	For	15%	16%	14%
For	Undecided	8	9	7
For	Against (switch *away*)	6	4	7
Against	For (switch *to*)	3	4	2
Against	Undecided	10	16	6
Against	Against	25	11	32
Didn't vote in last election		33	38	31
NET LOSS OF VOTES Equals Line 3 (Switches AWAY) Minus Line 4 (Switches TO)		3%	0	5%

★ FACTORY's interviewers inserted here the names of the Senator or Senators from respondent's state who had voted *for* the Taft-Hartley Act. In states where *both* Senators opposed, these questions were not asked

● The 21 per cent of workers who say they would switch their votes to support a union-endorsed candidate constitute a fairly small minority. But they represent probably 3,000,000 votes at the beck-and-call of union leaders. The probable direction of union endorsements (if any) in 1948, however, makes that figure take on a far different complexion: 72 per cent of those who said they would switch voted for Roosevelt in 1944. Only 7 per cent of those who said they would change voted for Dewey in 1944; the remaining 21 per cent of "would change" workers didn't vote in the last Presidential election.

Sectionally, workers in the Middle Atlantic and Western states are most likely to change; 31 and 26 per cent, respectively, said "yes." In the South, the figure was only 14 per cent. And in the heavily CIO East-North-Central section, a surprisingly small 15 per cent of workers would switch.

Considered in the light of the violent union propaganda against supporters of the Taft-Hartley Act, the almost negligible shift of votes away from these Senators leads to just one conclusion: *Labor legislation is not the hot political issue union brass hats thought it was.* Even among union members themselves, only 7 per cent have been convinced that Taft-Hartley backers no longer deserve their support.

FACTORY also analyzed the shift of votes for Senators who *opposed* the Taft-Hartley law. Only 3 per cent of workers have decided to switch their votes to support these Senators. And 5 per cent have switched *away* from them despite their opposition. Net *loss:* 2 per cent.

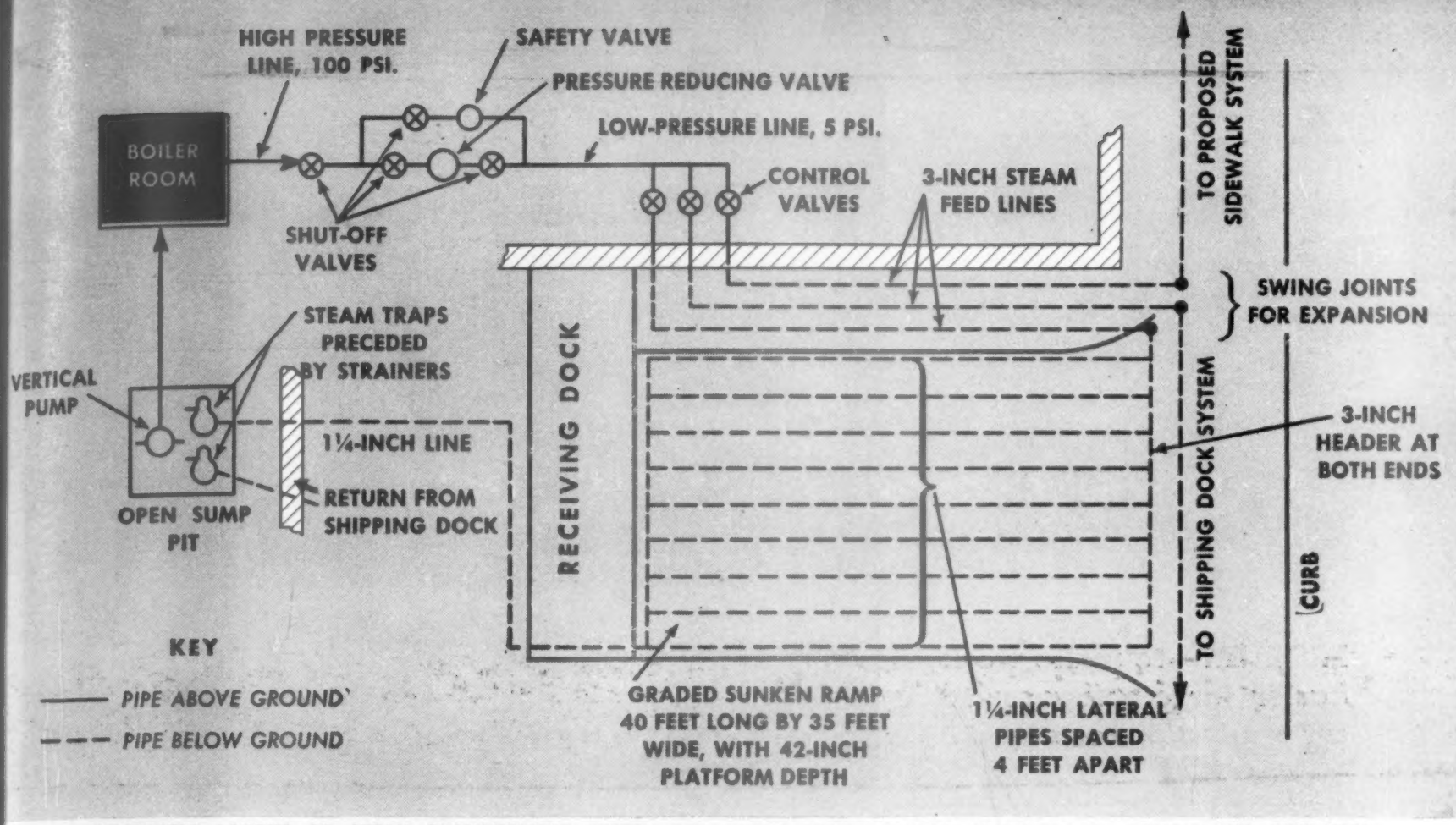
The only possible explanation for the fact that both backers and opponents of the Taft-Hartley Bill have lost support among workers is that issues far stronger than labor legislation are at work.

FACTORY found, too, that knowledge of how a particular Senator had voted on the Taft-Hartley Bill had little effect on whether or not a worker changed his vote. When asked which way their Senators voted (each worker was asked twice, once for each Senator), 42 per cent of the identifications were correct. Among those who *knew* that their Senator supported the Taft-Hartley Bill, the net shift *away* was 6.5 per cent, compared with 3 per cent among all workers. Among those who *knew* that their Senator opposed the Taft-Hartley Bill, the net shift *to* these men was 1 per cent, compared with a net shift of 2 per cent *away* among all workers.

The more-or-less negative results of questions pertaining to labor legislation should not be interpreted as meaning that workers are not politically conscious. FACTORY asked respondents to name the Senators from their states (*later* supplied correct names for questions reported above), found that 48 per cent could name correctly *both* of their Senators. An additional 22 per cent could name *one* Senator correctly. These figures differed by only 3 per cent as between union and non-union workers. The only significant variation by geographical region was New England: 57 per cent named both Senators correctly.

Measured against similar polls among the general public, the degree of recognition of Senators is remarkably high. It is a good indication that workers have politics firmly fixed in their minds – but not necessarily because of the Taft-Hartley Act.

NEXT MONTH: What the Factory Worker Really Thinks About His Job; Unemployment; and Industry's Profits



SCHEMATIC LAYOUT OF STEAM SNOW-MELTING SYSTEM FOR TRUCK RAMPS SHOWS SIMPLICITY OF DESIGN AND OPERATION

SNOW REMOVAL BY STEAM HEAT

RALPH B. THOMPSON • PLANT ENGINEER, CARROLL DUNHAM SMITH PHARMACAL COMPANY, NEW BRUNSWICK, N. J.

LIVE low-pressure steam is being successfully used in the snow-melting systems under our open-air shipping and receiving truck ramps.

In operation for the first time during the 1946-1947 winter season, these systems have proved practical and economical. Condensate measurements show an average total steam consumption of about 200 pounds of steam per hour when in use. This takes care of 6200 square feet of ramp area. High thermal efficiency is maintained because all condensate is returned to the boiler.

Schematic layout of the steam-supply line and the piping in the underground melting system for the receiving dock is shown herewith. The system for the shipping ramp is the same width and twice the length, but otherwise similar in design and specifications.

Several other important features have contributed to successful operation. Underground steam lines from the point of burial at the control valves were pitched to drain gradually into the open sump pit.

The header-type of heating coil was chosen, rather than the continuous serpentine coil, to keep the lines as short as possible. Distances from the control valves to the sump are about 120 feet for the receiving dock system, and 260 feet for the shipping dock system.

Boiler Return System

The bucket trap at the end of each system discharges into an open indoor pit. Condensate accumulated here is then pumped into the boiler return system by a motor-driven vertical pump with a float switch adjusted to keep the water level below trap outlets.

All underground pipe is wrought iron, laid on top of a bed of washed sand 8 inches deep. Over the entire run of underground piping was placed a strip of hair felt, ½ inch thick by 18 inches wide. The purpose of this was to even out the heat distribution, and to allow for pipe expansion and contraction by elimination of a bond with the concrete surfacing. This surfacing consists of an 8-in. layer of concrete, reinforced by a single layer of 6x6 steel mesh to withstand the heavy truck loads. Customary asphalt expansion joints were provided.

When first installed, the system was directly connected to the high-pressure steam line, and controlled with one shut-off valve. This valve was turned on whenever it began to snow. It was discovered, however, that the time lag in heating the chilled concrete ramps to a melting temperature caused the snow to be reduced to slush instead of water.

With the present reducing-valve hook-up, whereby low-pressure steam at 5 pounds is used, only the low-pressure valves at the control manifold are used to operate the system. These are opened in cold weather whenever there is a likelihood of a snowfall or sleet storm. This preheating technique with low-pressure steam has proved effective as well as more economical. Actual pressure drop of the system has been measured at the steam traps as less than one pound.

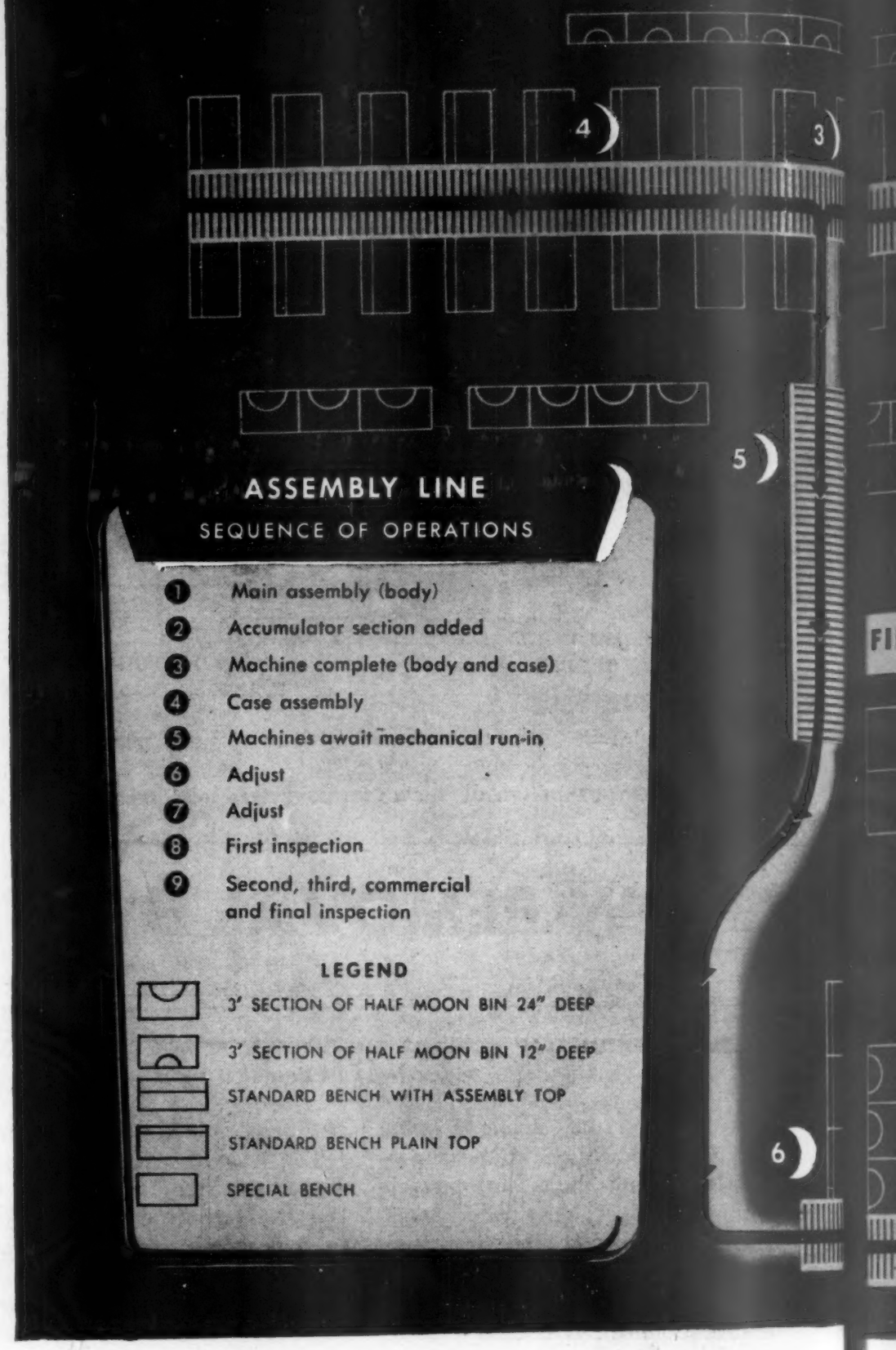
PROBLEM — to make work easier for employees; to cut production costs

•

SOLUTION — plantwide application of work simplification principles

•

RESULTS — worker fatigue minimized; production increased by more than 50 per cent; cost of operation down accordingly



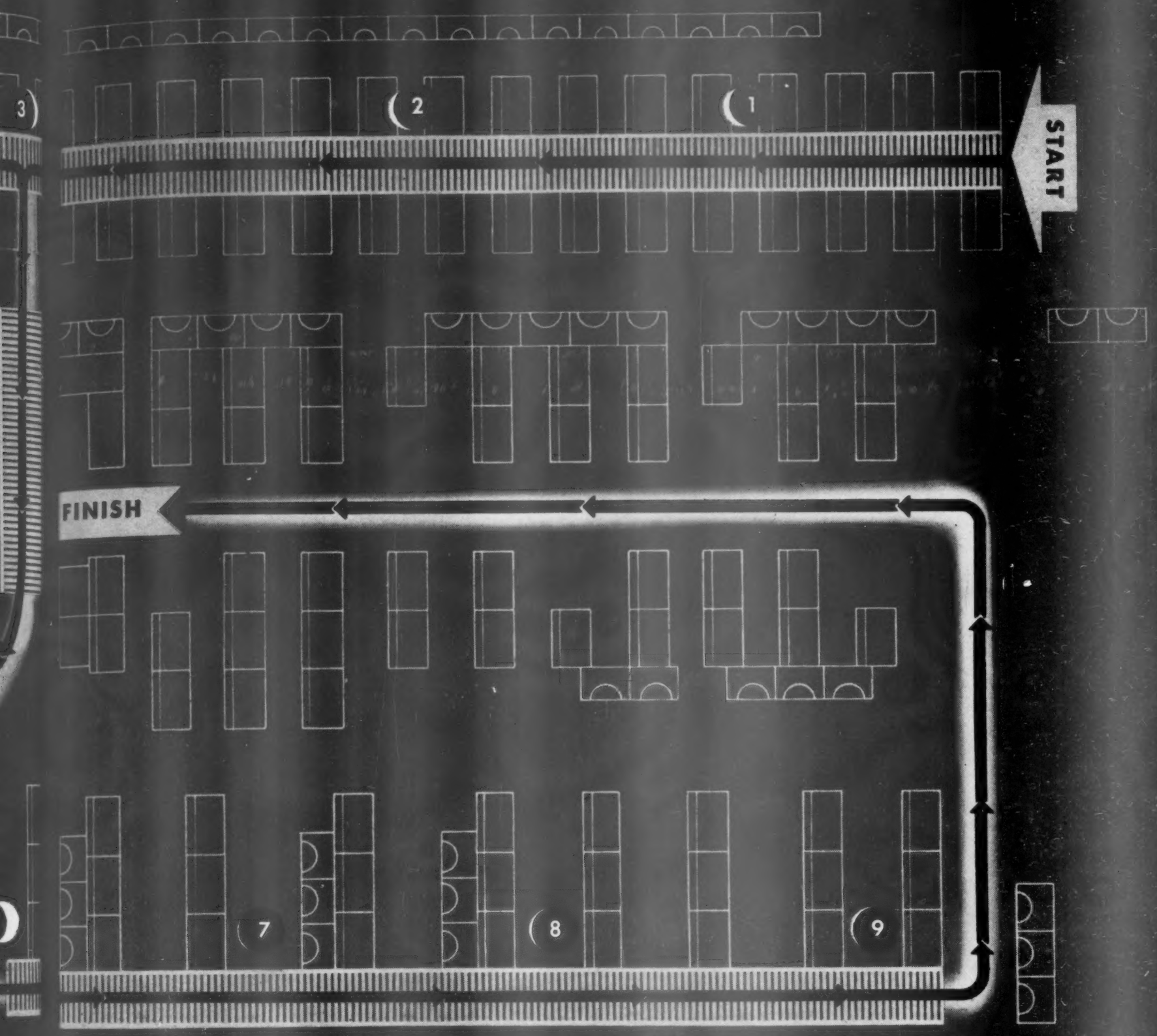
THREE ASSEMBLY LINES BECAME ONE LINE WHEN METHODS MEN SET OUT TO CUT COSTS

PLANTWIDE COST REDUCTION RAISED OUTPUT 50 PER CENT

OTTO MADLIGER • WORKS MANAGER, VICTOR ADDING MACHINE COMPANY, CHICAGO

PRODUCTION was increased at Victor by more than 50 per cent. Working conditions were improved. Worker fatigue was reduced to the minimum. Charge it all up, we say, to plantwide application of work simplification principles.

Our program was inspired by management's desire to make work



IT'S STRAIGHT-LINE FLOW FROM START TO FINISH. PARTS STORAGE LOCATED NEAR POINTS OF USE. MINIMUM EFFORT BY OPERATORS

easier for employees, to reduce costs, and to improve the quality of the product. First step was to assign several expert time study and methods men to the works manager's office. It was their job to make a thorough survey of all factory operations to determine what could be done to simplify the work and to make Victor a better plant to work in.

Good example of what we accomplished is found in the main assembly department. (See the machine assembly layout diagram at the top of the page.)

OLD METHOD

Originally the assembly was set up on three separate lines, one for each of the high-production models. Each worker assembled a complete machine. There was no subdivision of work. Fatigue was a big factor; workers had to lift machines as they were moved from one operation to the next. The methods men quickly realized that it would be more efficient to convert to mass production and to assemble all models on one main line. This was possible because so many subassemblies and parts were common to all models.

NEW METHOD

Management accepted their recommendation. All final assemblies were put on a single line. All common subassemblies were segregated on separate lines to feed the main

LOOKING DOWN LINE TOWARD POINT MARKED "START" ON LAYOUT DIAGRAM (PAGES 98 AND 99). BEST USE MADE OF DAYLIGHTING

line. Efficiency has been improved. Cost has been reduced. Work is easier. Confusion has been eliminated. There is a smooth flow of work through the department. Workers who used to perform a simple operation can now do three or four. So—more versatile workers, and a layout that is far more flexible and efficient than the old one.

The layout diagram tells the story. Three roller conveyors have been installed. There is a long one running down the north side of the room between two rows of assembly benches. There is another, not quite so long, that runs down the south side of the department. And there is a short section running across the room. Conveyors are installed at bench height. This means no lifting.

Basic purpose of this installation is to force materials to flow in a straight line, and to eliminate the fatiguing task of lifting adding machines all day long. Machines now feed from one operation to the next with minimum effort on the part of the individual worker.

Not only that, but it is possible to set a pace for the entire line by placing the best operators at important stations in the assembly process. Work moves through, therefore, with little or no drag.

Work Flow Balanced

Feeder lines were completely reorganized. Previously many of these could not keep up with the assembly lines. Work flow has now been balanced. Materials flow evenly through the plant. No longer do workers in one department have to be laid off for a few days while another department catches up.

Stockrooms were formerly lo-

CLOSE-UP VIEW OF STATION AT START OF ADDING MACHINE ASSEMBLY LINE. WORKBENCH PLANNED FOR ECONOMY OF MOTION

cated along the exterior walls. This practice cut down considerably on the amount of natural light in production departments.

All this has been changed. Fabricating and assembly departments are now located along the walls; stockrooms are placed in interior or "dead" space. Not only that, but they are closer to the point of use. Distances required to move stock are shorter. And workers get more natural light.

Scheduling of such common parts as screws, washers, and springs has been eliminated. They are now stored in strategic positions throughout production areas – in portable stock racks, each containing 48 pigeonholes.

Paperwork Minimized

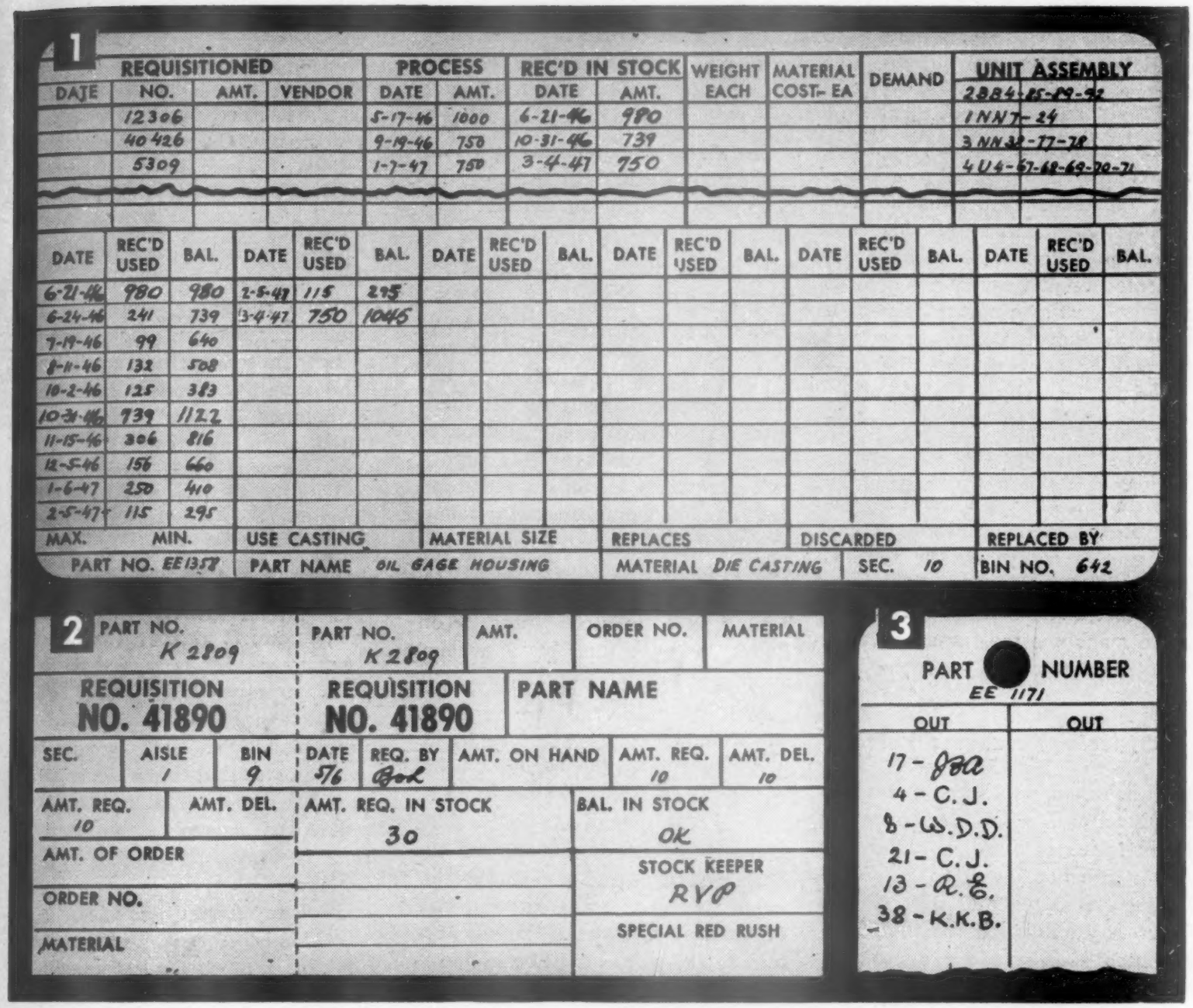
A specially assigned dispatcher sees to it that there is at all times an ample supply of such parts on hand at each assembly station. He makes periodic trips through production areas. If a station needs additional stock, he removes the empty pan from the station and leaves a full one. Two types of stock pans are used – a "breadpan" for smaller parts, a "totepan" for larger ones.

This system minimizes the amount of paperwork needed. And it assures production of ample materials on hand at all times. It means further that there will always be enough parts on hand at starting time; the dispatcher begins work 30 minutes ahead of the main lines.

To assure ample supplies of other parts, each departmental foreman submits a daily list to the production control department. Control is accurate. And the system builds cooperation between departments.

STOCK WITHDRAWAL RECORDS ARE KEPT ON BIN TAGS. TAGS ARE CHECKED EVERY 30 DAYS WITH PERPETUAL INVENTORY RECORDS

OPERATORS NEVER WAIT FOR PARTS. ENOUGH FOR A FULL WEEK IS KEPT IN REVOLVING TRAYS AT EACH SUBASSEMBLY STATION



1

REQUISITIONED				PROCESS		REC'D IN STOCK		WEIGHT EACH	MATERIAL COST- EA	DEMAND	UNIT ASSEMBLY
DATE	NO.	AMT.	VENDOR	DATE	AMT.	DATE	AMT.				2884-85-89-92
	12306			5-17-46	1000	6-21-46	980				1NN7-24
	40426			9-19-46	750	10-31-46	739				3NN32-77-78
	5309			1-7-47	750	3-4-47	750				4U4-67-68-69-70-71

DATE	REC'D USED	BAL.	DATE	REC'D USED	BAL.	DATE	REC'D USED	BAL.	DATE	REC'D USED	BAL.	DATE	REC'D USED	BAL.	DATE	REC'D USED	BAL.
6-21-46	980	980	2-5-47	115	295												
6-24-46	241	739	3-4-47	750	1045												
7-19-46	99	640															
8-11-46	132	508															
10-2-46	125	383															
10-31-46	739	1122															
11-15-46	306	816															
12-5-46	156	660															
1-6-47	250	410															
2-5-47	115	295															

MAX. MIN. | USE CASTING | MATERIAL SIZE | REPLACES | DISCARDED | REPLACED BY

PART NO. EE1358 | PART NAME OIL GAGE HOUSING | MATERIAL DIE CASTING | SEC. 10 | BIN NO. 642

2

PART NO.	PART NO.	AMT.	ORDER NO.	MATERIAL
K 2809	K 2809			

REQUISITION NO. 41890	REQUISITION NO. 41890	PART NAME

SEC.	AISLE	BIN	DATE	REQ. BY	AMT. ON HAND	AMT. REQ.	AMT. DEL.
	1	9	5/6	Bol		10	10

AMT. REQ.	AMT. DEL.	AMT. REQ. IN STOCK	BAL. IN STOCK
10		30	OK

AMT. OF ORDER | STOCK KEEPER: RVP

ORDER NO. | SPECIAL RED RUSH

MATERIAL

3

PART ● NUMBER
EE 1171

OUT	OUT
17 - JBA 4 - C.J. 8 - W.D.D. 21 - C.J. 13 - R.E. 38 - K.K.B.	

PERPETUAL INVENTORY CARD (1) provides data on parts orders and receipts, also a list of parts. "Balance in stock" on requisition (2) is checked on withdrawal against minimum requirements. Bin tags (3) must check monthly with inventory cards

LOW-COST INVENTORIES THROUGH CLOSE CONTROLS

CHARLES R. SCHUBERT • FIELD EDITOR, *FACTORY*, CLEVELAND

CAREFUL planning and control of supply on hand has enabled Monarch Machine Tool Company, Sidney, Ohio, to maintain a high inventory turnover. The consequence has been that inventory charges are kept *low*. Figures from 1946 annual reports of eight of the leading machine tool manufacturers show Monarch leading the pack with an annual turnover rate of 3.6. Average of the other seven was 2.4.

Greatest factor in maintaining this leadership has been holding inventory at absolute minimum. Monarch never lets its supply of semi-finished and finished parts exceed actual needs—requirements for confirmed orders.

How has this been possible?

Standardization has played a big part. Design engineers have standardized parts *among* the various machine tools. This means less chance of surplus if cancellations develop in some lines. And parts purchased for use with type "A" can be used for "B," should the "A" number be redesigned.

Calculation of actual needs is based on the sales backlog, totaled at the end of each month. This backlog consists of all machines actually sold but not shipped. Basis of calculation is a cross-usage index (upper right of inventory control card, above) which lists the quantity of the part required for each machine tool model in which it is

used. Total requirements for a part are determined by multiplying the number of machines of the various types that have actually been sold by the quantity of the part required for each machine. The totals are then added for each machine that requires the parts. From this sum is deducted the balance in stock (as indicated on the inventory control card), plus the quantity issued to assembly for machines not yet shipped. This final figure is then adjusted for an overage to allow for spoilage. Orders for machines which will require odd or special materials, or new tooling, are withheld from inclusion in assembly schedules until receipt or production of the special equipment or tooling. This prevents the procurement or manufacture of standard parts for these machines too far in advance of actual needs.

Ordering Purchased Parts

Purchased parts are carefully analyzed and economical ordering quantities determined. Factors taken into consideration in establishing lot sizes are part of the value of the finished machines represented — discounts for quantity purchases, difficulties in storage space, and perishability.

From these, minimum ordering points are established. This is usually a month's supply, but greater if delivery is unsure. If inventory falls to the minimum ordering point, a purchase order is placed with a vendor for a quantity of the part not to exceed the economical lot size. A smaller quantity is ordered *if the difference between the calculated needs and the minimum ordering point is less than the economical lot size.*

Large parts, such as bed castings, are also ordered on the basis of needs, but actual delivery schedules on the orders are geared to the planer schedule.

Orders for parts made in Monarch's production machine shop are based on the same calculated monthly needs. Here, work orders for economical production runs *or less* are placed with the machine shop as soon as the total inventory in stock falls below seven weeks' requirements. This gives the scheduling section of the machine shop an idea of the backlog of operating hours which will be required of any particular bank of machines.

The total stock on hand anywhere in the plant depends on the machine shop production schedule, and varies as follows:

1. If the machine shop requires the entire seven weeks to produce the parts order, the full amount will be sent to the stockroom at the end of the period. During this time, the stockroom's entire supply will have been sent to the assembly department. (Five weeks of this supply will have been assembled and shipped. The one week subassembly and one week final assembly cycle account for the balance). The stock situation is therefore 7 (new supply) plus 0 (in stock) plus 2 (on floor), a minimum of 9 weeks' supply.

2. If the machine shop requires the average time (3½ weeks) to produce the order, seven weeks' supply is sent to the stockroom at the end of three and one-half weeks. During this time the stockroom has delivered three and one-half weeks' supply to the assembly department, of which two weeks' supply remains. The stock situation is therefore 7 plus 3½ plus 2, or an average of 12½ weeks' supply.

3. If the stockroom produces the order immediately, the seven weeks' supply is sent to the stock room before any of the seven weeks' supply on hand in the stockroom is exhausted. The stock situation is therefore 7 plus 7 plus 2, or a maximum of 16 weeks' supply.

But even the maximum 16 weeks' supply can never exceed the number of parts required to produce those machines which are actually on order.

The method of dispensing parts from the stockroom is geared to assuring a steady supply of parts at all times. Each subassembly is made by an individual skilled craftsman at a separate work bench. A subassembly stock man is responsible for keeping at each man's bench, in the proper storage shelves, a week's supply of parts.

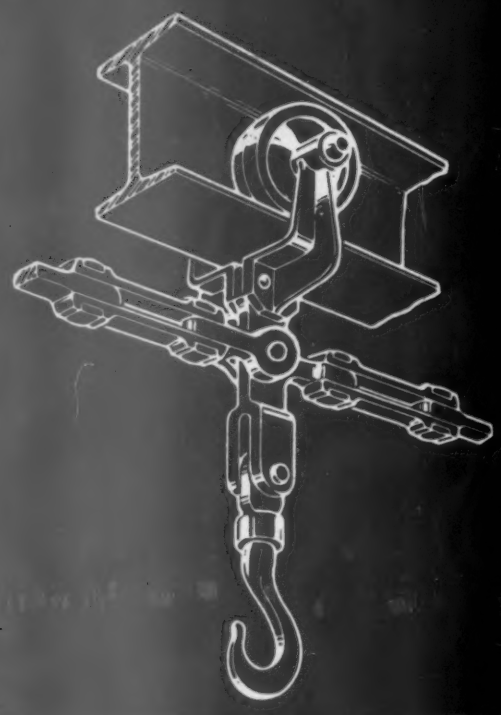
The production-planning department furnishes the subassembly stockman with a list of parts required for the subsequent two weeks' assembly. To obtain the next week's supply of parts, a stock requisition is filled out and taken to the stock bin. On removing material from the bin, the quantity removed and the stock clerks initials are noted on the stock bin record card (see figure on page 103).

The quantity on hand now is checked roughly against the "amount required in stock," which had been noted on the requisition. If the quantity appears sufficient, the "balance of stock" space on the requisition is marked "O. K."; if below the required amount, the actual balance is counted and entered.

After the parts have been delivered to the assembly floor, the requisition is forwarded to the production-planning department. When the balance left in stock (shown on inventory cards) is less than *five* weeks' supply a "Red Rush" card with the work order number is sent to the machine shop. If the requisition indicates that there is less than three weeks' supply, a "Special Red Rush" card is sent to the shop. If there is only *one* week's supply (none in stock and one week at assembly) an "Arrow" card is originated. This card constitutes an order to the machine shop superintendent to stop production immediately on a machine capable of producing the part and set it up for the critically short supply order.

Inventory Control Records

Inventory control cards are filed in visible-index card files by part numbers. Requisitions to vendors or work orders for processing in the machine shop are entered in the upper left hand corner. As material is received in the stock room, the quantity and date received is entered in the "received in stock" column in the top half of the inventory control cards. In the lower half of the card, the receipts are noted in red and added to the stock at hand, as requisitions from stock are entered and subtracted from a previous balance. Thus a perpetual inventory of parts is maintained. As a check, stock record cards are removed monthly to the planning office where they are used to verify the inventory control cards.



TROLLEY CONVEYORS

SIDNEY REIBEL
MATERIALS HANDLING CONSULTANT

ALBERT KAHN ASSOCIATED ARCHITECTS
AND ENGINEERS, INC.

DETROIT

1. GENERAL FEATURES

2. WHAT TO BUY

3. LAYING OUT THE CONVEYOR

4. TROLLEY CONVEYOR DRIVES

5. ATTACHMENTS AND CARRIERS

6. GUARDS AND RUNAWAY STOPS

ACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 108 • November, 1947
opyright, 1947, by McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y.

1. GENERAL FEATURES

THE power-driven trolley conveyor finds wide use in modern industrial plants because it has almost unlimited possibilities in capacity, flexibility, and length. It consists of an endless chain on edge (i.e., the center lines of the chain joints are always in a vertical plane), suspended by trolleys from an overhead track.

Products conveyed are hung from attachments at each trolley, or at longer intervals with intermediate trolleys between the loads, depending on their size and on the capacity required. Light loads are sometimes suspended from attachments on the chain itself. Materials are carried by various types of suspended trays, racks, hooks, pans, baskets, or slings.

The path of travel can be any combination of horizontal and inclined straight runs joined by curves, and can be long or short, and as irregular as necessary to meet requirements. Trolley conveyors can be routed to clear existing equipment, go up over aisles and machines, and down to work stations. They can be altered readily and can be combined, divided, lengthened, or shortened to suit any condition. Changes can be made without interrupting production.

LOADS and ECONOMY. Parts may be handled singly or in groups. They may be almost any shape and size. And they may weigh anything from a fraction of an ounce up to more than a ton.

Trolley conveyors give remarkable service even when operated under adverse conditions, or abused by overloading and neglect. Initial costs are low; power requirements are very small. There is practically no maintenance, and they have a very long life. The entire length is usable; salvage value is high.

SPACE REQUIREMENTS. The cross-section of the conveyor itself is very small and, with the carriers, does not take up much more space than the loads alone. The flexible nature of the conveyor allows it to be operated in locations that otherwise would be wasted. The high runs leave the floors clear underneath, and are used to provide mobile storage for work in transit.

Overhead suspension of loads leaves a clear space underneath, even at low levels, which can be used as a storage or work space. Workers can often safely pass between loads to go from one side to the other.

USES. The conveyor can be employed efficiently for any combination of transportation, storage, processing and assembly. It can be used simply to transport the material from one point to another. Work can be done on the material while it is in transit. Or different operations can be performed by the conveyor itself.

Therefore trolley conveyors are used for:

1. Moving incoming parts and raw materials from receiving docks to storage, and outgoing parts to shipping docks.

2. Carrying parts between storage and manufacturing, and from one department to another.

3. Carrying work in process from one operation to another; through assembly, inspection, packing.

4. Mobile storage in warehouses and overhead spaces; also to provide storage between operations.

5. Transportation between buildings and over long distances, as from one plant to another.

6. Handling parts through processing, such as spray and dip painting, rustproofing, sanding, washing, degreasing, drying, baking, cooling, sandblasting; and through enameling, annealing and heat-treating ovens.

7. Foundry work such as assembly of molds; pouring operations; cooling castings and forgings; baking cores and molds.

8. Towing industrial trucks in warehouses and terminals; also for towing autos through washing, and similar towing jobs.

9. Pushing carriers operating on adjacent, non-powered monorail tracks, with optional automatic or manual engage and disconnect features.

It is quite common to combine economically, on one conveyor, several of the functions in the preceding list.

CONSTRUCTION and SIZES. Trolley conveyors use a single strand of chain and two-wheel trolleys. (Four-wheel trolleys have been tried, but are seldom used now.) The track consists of a single I-beam or tee, or double angles or T-rails.

The most generally used combination is a single I-beam track; drop-forged, two-wheel, ball-bearing trolleys; and drop-forged, rivetless chain.

2. WHAT TO BUY

THE purchase of an ordinary trolley conveyor does not require elaborate specifications. The buyer can get the most for his money by watching the following points, and specifying these features, when necessary.

See that layouts allow for future extensions with the least number of changes. Dips and turns may cost less if installed at once instead of later.

Check the layout as explained later.

CHAINS. Use standard chains, especially the drop-forged type. See Figure 1. Special chains can be used for short, light-duty conveyors.

Heat-treated chain costs about 10 per cent more than plain chain, and is worth the difference in extra wear and strength. Plain and heat-treated chains look alike, but should not be mixed. When a plant standardizes on heat-treated chain, it can be used anywhere

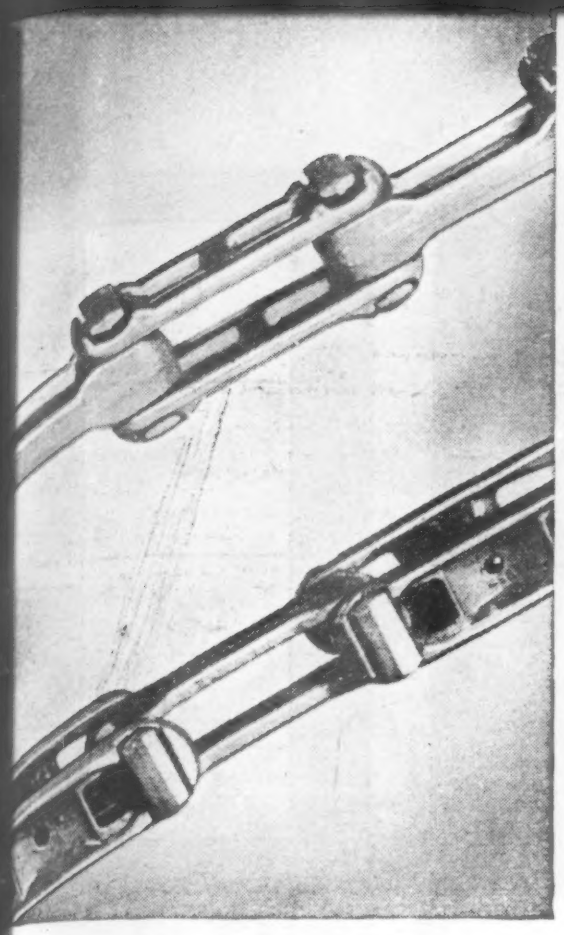


FIGURE 1

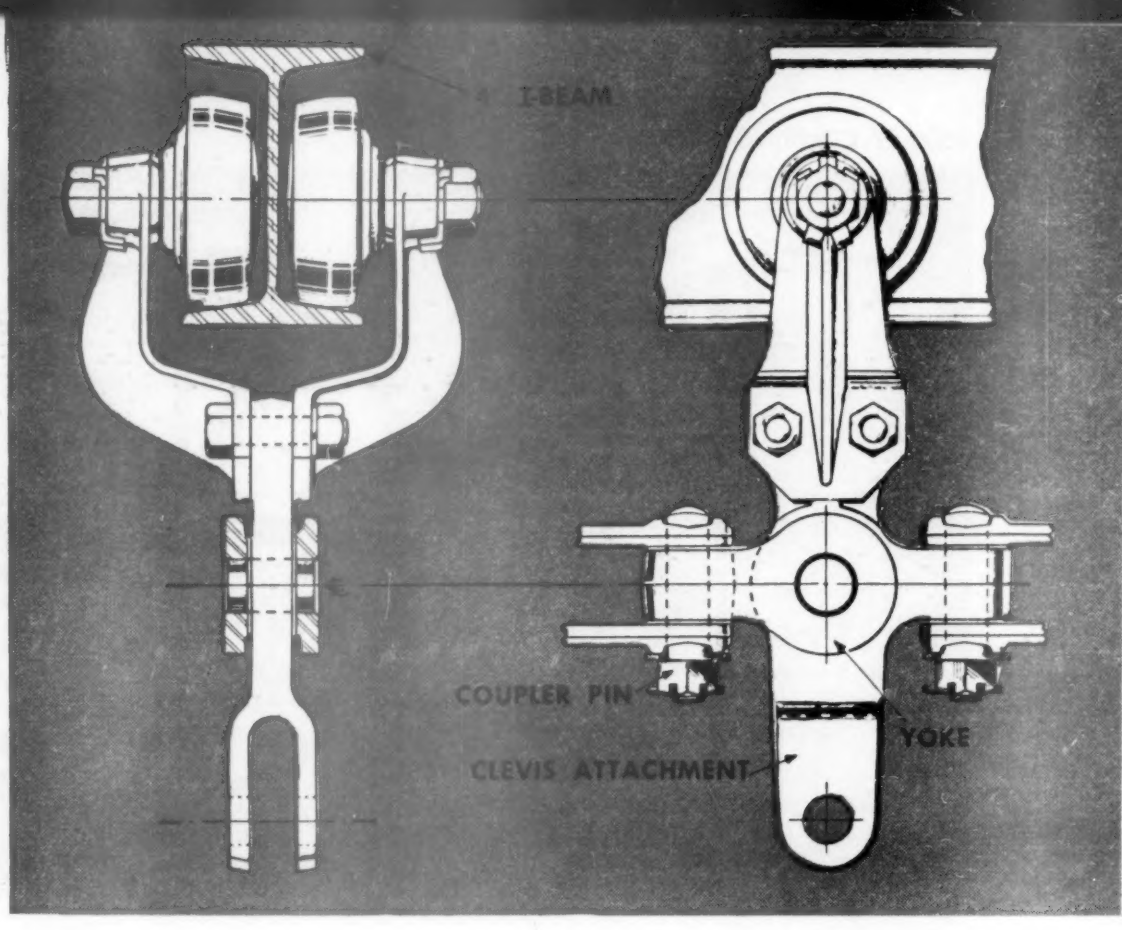


FIGURE 2

to the limit of its capacity. On the other hand, if a plain chain conveyor is combined with a heat-treated one, there will be uneven wear, and the allowable chain pull will be limited to the lower value for plain chain. In large plants, where changes are many, the advantages of having all chains alike are obvious.

TROLLEYS. Use drop-forged, ball-bearing trolleys with drop-forged side arms and attachments, and lubrication fittings. Figure 2. Get a good make that has proved satisfactory in practice. Obtain samples, with felt seals omitted, so that the fit and smoothness of the ball bearings can be checked. The fit should be slightly loose. Check the roundness and smoothness of the tread, and see whether it is concentric with the bearing. Test alignment of trolley assembly to see whether the wheels will bear equally on the track.

Use a type of bearing seal that will be effective throughout the plant. This makes the trolleys interchangeable, in use as well as dimensions.

ATTACHMENTS. Use standard attachments for trolleys. The H (or clevis) attachment is the most adaptable, and is used more than any other. Specify H attachments for intermediate trolleys between loads. They cost very little more than the I (or idler) attachments, which can be used for nothing else.

Attachments are discussed in more detail later.

DROP. The distance from the top of the I-beam to the center line of the chain is called the drop. All trolleys, horizontal bends, and drives in a plant should have the same drop so that they will be interchangeable. This does not limit the purchaser to any one supplier, since most conveyor companies can furnish these items for any standard drop.

TRACK. I-beam track should be high-carbon rail steel. It should be straight and true with smooth flanges, free from waves, and of uniform width. Flanges should be square, and central with the I-beam web. All curves should be rolled true to radius, with proper tangent connections. Horizontal curves must be aligned with roller turns and traction wheels.

Joints must be strong and well matched, and ground smooth where the track and trolleys make contact. In areas where the fire hazard prohibits welding, use bolted connections for the joints. Otherwise, use welded joints.

HANGERS and SUPERSTRUCTURE. Hangers for the conveyor should be well braced, especially at the corners, with adequate connections at top and bottom.

Superstructure is the extra framing required at points where the hangers cannot be attached directly to the building framing. Conveyor contractors have so much experience in working out the arrangement of superstructure that it seldom pays to have it furnished by others.

All connections of hangers and superstructure to building steel should be clamped, with drilling, cutting, burning, or welding allowed only by special permission from the owner. This prevents damage to the building, and if the conveyor is removed in the future, the building structure can be restored to its original condition.

Floor supports may be required, but are more expensive than hangers. When used, specify adequate anchor bolts and minimum deflection.

HORIZONTAL BENDS. Use roller turns except in injurious atmospheres. Ball-bearing rollers preferably should have hardened, machined treads, be well sealed, and provided with lubrication fittings. Figure 3. Large-radius turns are desirable, but remember that cost is proportional to the radius.

Wheel turns are preferable in injurious atmospheres, or where maintenance is difficult. Also they

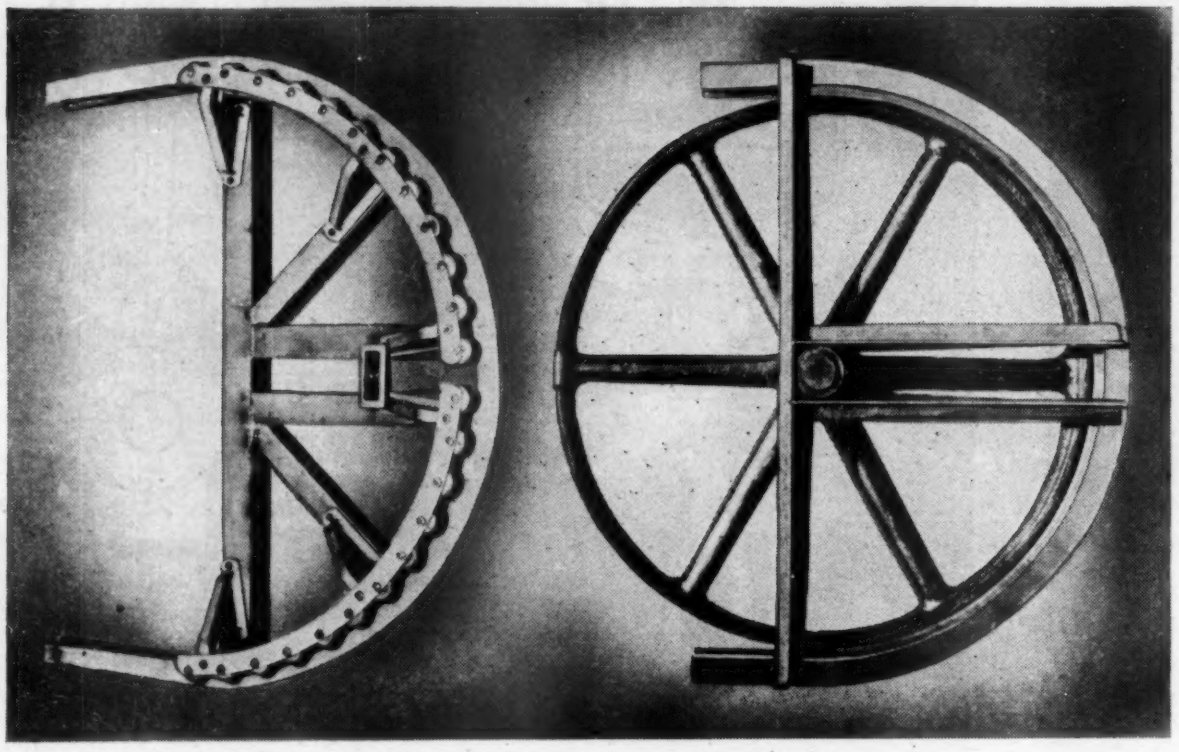


FIGURE 3

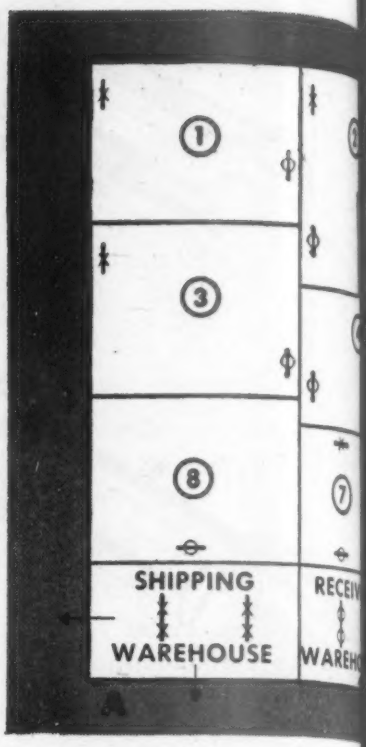


FIGURE 4

help to reduce chain pull on long conveyors. Traction wheels with sealed roller-bearing hubs are best, but other types may be used in locations where the bearings can be well protected. Wheel turns are more expensive than roller turns.

Roller and traction wheel turns may be used in combination on the same conveyor.

When the radius of bends is selected, keep in mind possible future use. A standard radius and standard angles are desirable so that the turns will be interchangeable throughout a plant.

DRIVE UNITS. When specifying a drive unit keep in mind the possibility that it may later be used on another conveyor. To get the greatest flexibility, and lowest maintenance expense, the drive unit should meet the following conditions:

1. It should be a caterpillar drive.
2. It should be of variable-speed design.
3. It should have a chain pull capacity not less than a desirable minimum for the plant.
4. All bearings should be anti-friction type, requiring infrequent lubrication.
5. Drives should have a mechanical overload device, preferably one that does not have to be reset. Replacing a shear pin takes time, and can cause expensive production losses.

If two or more (multiple) drives are required, make a careful check of the relative merits of mechanical and direct current speed and load-sharing synchronization. A comparison of costs should include all electric power and control wiring.

GUARDS. Safety requirements will call for guards. Choose a construction that is simple and cheap, since guard cost can be a major part of the total price paid for the conveyor. Also choose a guard with large mesh openings which will least obstruct the light.

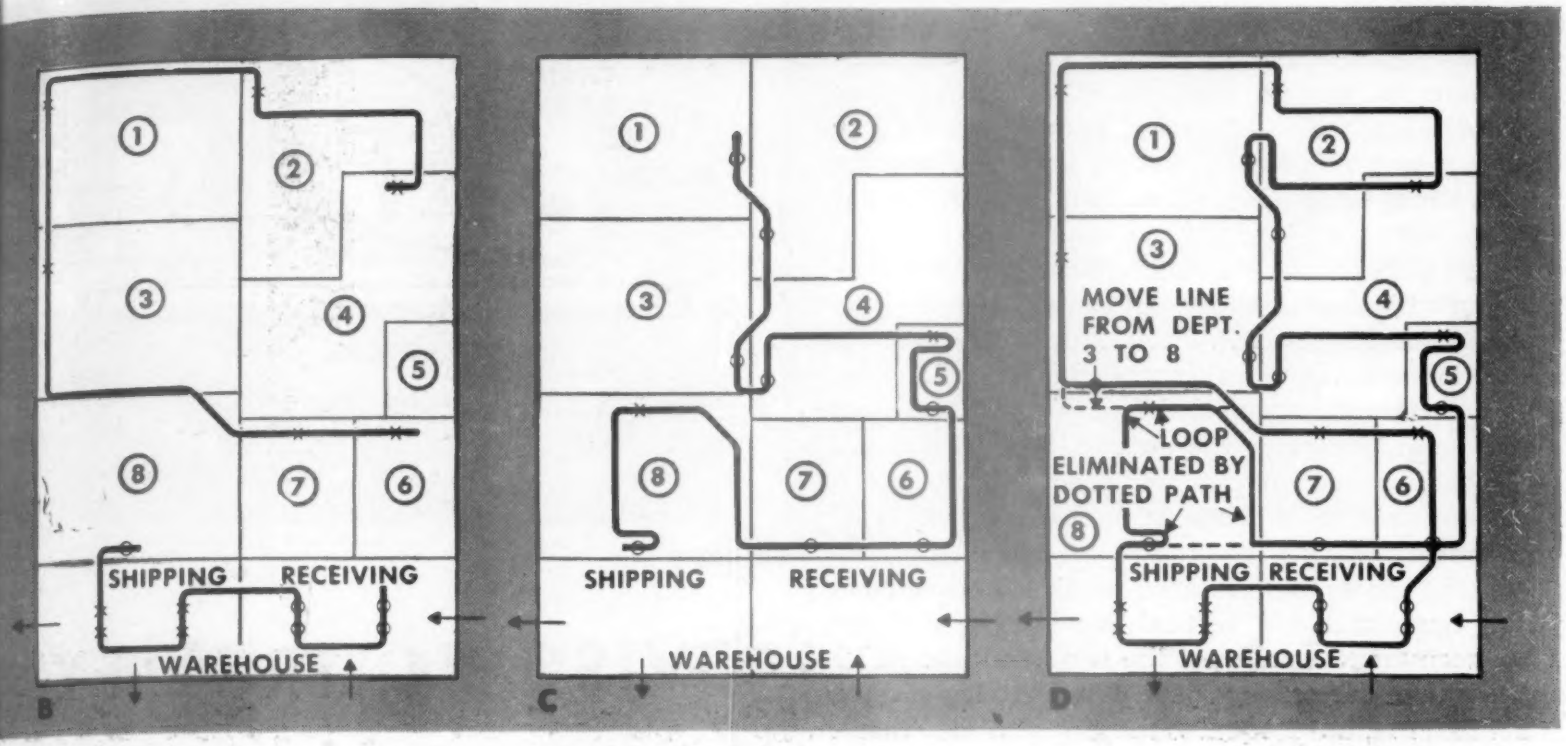
3. LAYING OUT THE CONVEYOR

THERE are no rules or definite methods that can be followed in laying out the path of a trolley conveyor. Some conveyors are easy to lay out. Others, because the route is long or irregular, will require the exercise of considerable ingenuity. The usual practice is to make the conveyor fit the layout of buildings and machinery, rather than *vice versa.*

EXAMPLE. A manufacturing plant has the department layout shown in Figure 4A. Raw materials must go from receiving storage to departments *1, 2, 3,* and *4* and must be further processed in department 5. The output of departments *5, 6,* and *7* must go to department *8* for inspection and packing, and then to shipping storage. The problem is to lay out a single conveyor to handle materials in the proper order.

First Step. From detailed department layouts locate on the plan, Figure 4A, the points *X* where materials will be unloaded from the conveyor to enter each department, and the points *O* where they will be loaded back on the conveyor when they leave the department. Conveyor dips (vertical bends) will be required at each of these points.

The direction of the conveyor line at the dips must suit the department layout, and is now marked at each point.



Second Step. Join the points marked *X* in departments *1, 2, 3, 4, 6,* and *7*. Also join the warehouse loading and unloading points, and connect with point *O* in department *8*. Figure 4B.

Third Step. Now join points *O* in departments *1, 2, 3,* and *4,* and *X* in department *5*. Continue to *O* in departments *5, 6,* and *7,* and to *X* and then *O* in department *8*. Figure 4C.

Fourth Step. Combine the layouts in Figures 4B and 4C as in Figure 4D. Join *O* in department *1* with *X* in department *4,* and *O* in the receiving warehouse to *X* in department *6,* taking care to make one run high and the other one low where the conveyor lines cross.

If more than one path can be drawn, try all possible arrangements. Select the one that is the shortest and has the least number of turns, provided it is satisfactory from the operating viewpoint. Try to see whether backtracking can be eliminated.

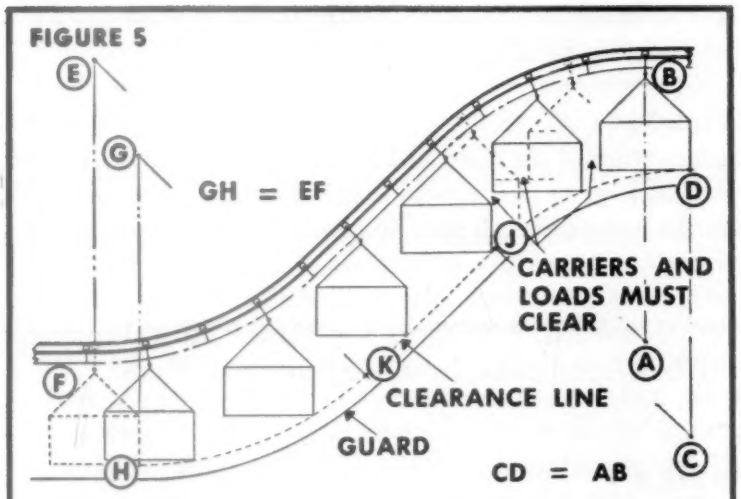
A slight change in conditions may improve the layout. For instance, if raw, processed, and semiprocessed materials can be loaded on the conveyor at the same time (either on the same or different carriers), and if the capacity is ample, a change can be made that will show a considerable saving. In this example the dotted path in Figure 4D will eliminate the backtracking loops in department *8*.

CLEARANCE DIAGRAMS. The path of the conveyor must allow for external clearance, such as headroom over aisles, workers, and machines, and under trusses, beams, piping, ducts, wiring, and lights. Horizontally, the conveyor must clear the same obstructions, as well as columns, walls, and other items. Guards for high conveyor lines add to the clearance requirements.

Internal clearance must be provided so that carriers, loads, guards, and chain do not foul or interfere with each other.

Figure 5 shows the method to use in laying out clearances at vertical bends. To lay out the bottom

FIGURE 5



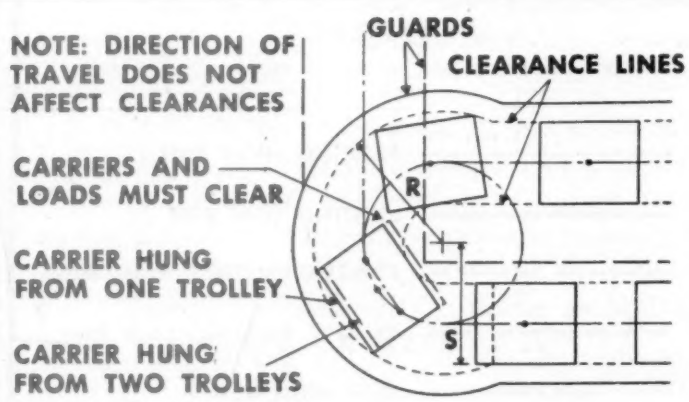


FIGURE 6

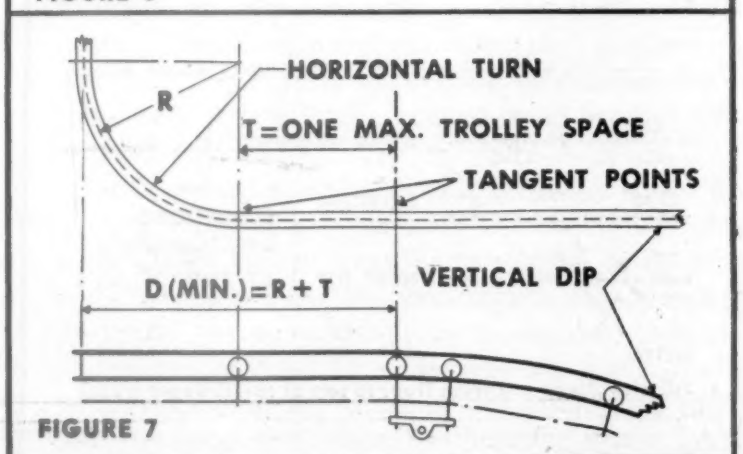


FIGURE 7

clearance line, determine first points *D* and *H* at the top and bottom of the dips, where the loads or carriers start to change elevation. Then with radius $CD = AB$, and radius $GH = EF$, lay out arcs *DJ* and *HK*. Join tangent points *J* and *K*, and the clearance line *DJKH* is established. (Note that radius *EF* is not equal to *AB*.)

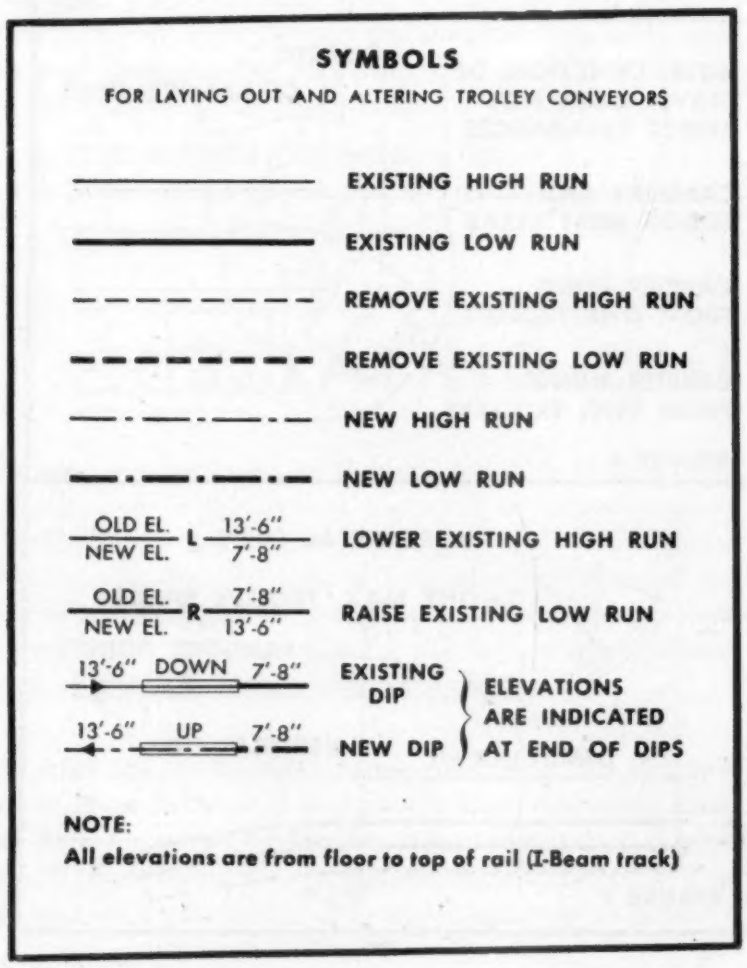
Figure 6 shows the clearances that must be determined at horizontal bends. Clearance radius *R* is greater than dimension *S*. The clearance lines shown are for loads and carriers suspended from one trolley. When carriers are suspended from two trolleys, less clearance is needed at the outside, but more is required on the inside curve, and the spacing between loads may have to be increased so that they will clear each other.

Figure 7 shows the clearance required between adjacent horizontal and vertical curves. The distance *T* between tangent points of the two bends should be not less than one trolley space. When trolley spacing is not uniform, use *T* equal to the largest trolley space. The space between horizontal and vertical bends prevents twisting of the chain, which would cause excessive wear on all the chain and trolleys, and on the track at this point.

SYMBOLS. After the path of a conveyor is determined, show it on the plant layout in the manner indicated in Figure 8. A single line indicates the path, with double lines on each side to indicate a vertical rise or drop. Sometimes the elevations of the top of the track are shown, being indicated at the ends of dips.

When several conveyors are shown on a drawing, each one is indicated by a different type of line.

FIGURE 8


SYMBOLS
FOR LAYING OUT AND ALTERING TROLLEY CONVEYORS
EXISTING HIGH RUN
EXISTING LOW RUN
REMOVE EXISTING HIGH RUN
REMOVE EXISTING LOW RUN
NEW HIGH RUN
NEW LOW RUN
OLD EL. / NEW EL. L 13'-6" / 7'-8"
LOWER EXISTING HIGH RUN
OLD EL. / NEW EL. R 7'-8" / 13'-6"
RAISE EXISTING LOW RUN
13'-6" DOWN 7'-8"
EXISTING DIP
13'-6" UP 7'-8"
NEW DIP
ELEVATIONS ARE INDICATED AT END OF DIPS
NOTE:
All elevations are from floor to top of rail (I-Beam track)

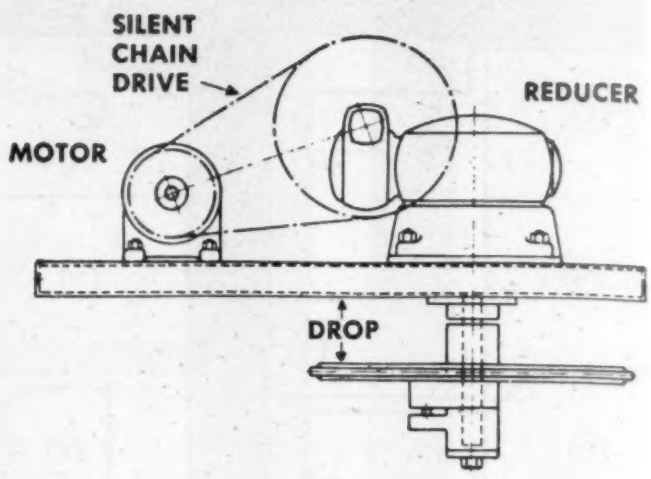


FIGURE 9

4. TROLLEY

A DRIVE UNIT is preferably located on a high run, preceding a down dip where the weight of the chain, trolleys, and carriers will pull the slack in the chain away from the unit. The drive should not, however, be placed at the highest point of a high-lift conveyor. The portion of the building to which the drive is attached must be strong enough to sustain the chain pull, as well as the conveyor weight.

Headroom is usually limited under ceilings, and side clearances are small because of piping, ducts, wiring, and other obstructions. The various parts of a drive are therefore arranged in a line, and on about the same level. See Figures 9, 10, and 11. This arrangement makes a drive unit long, but height and width will be a minimum.

There are no general standards for trolley conveyor drives, excepting those that each manufacturer sets up for himself. Drives are of two general types: Type S, or sprocket drives, and type C, or caterpillar drives.

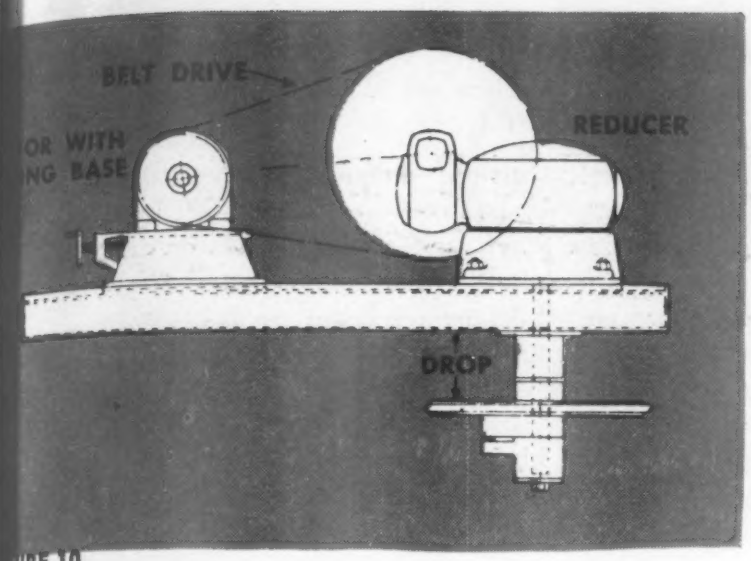
The general arrangement of the drive machinery, from the motor to the drive shaft, is the same for both types. It is the manner in which the drives engage the conveyor chain that makes them different.

SPROCKET DRIVE. This is the usual type of chain conveyor drive, where the conveyor chain is wrapped around and driven by the sprocket on the driveshaft. It is located at a 90 deg. or 180 deg. corner turn.

A drive unit is rated for chain pull at the head sprocket. Manufacturers' ratings are usually based on the use of a 36-in. pitch diameter drive sprocket, which is a size frequently used. These drives will have a constant torque rating. Therefore when drive sprockets other than 36-in. pitch diameter are used, the allowable chain pull will be inversely proportional to the pitch diameters of the sprockets.

Example. A drive is rated 2000 pounds chain pull with a 36-in. pitch diameter sprocket. What is the maximum chain pull with a 48-in. pitch diameter sprocket? The new chain pull $= 2000 \times (36 + 48) =$ 1500 pounds.

The torque rating will not change.



URE 10

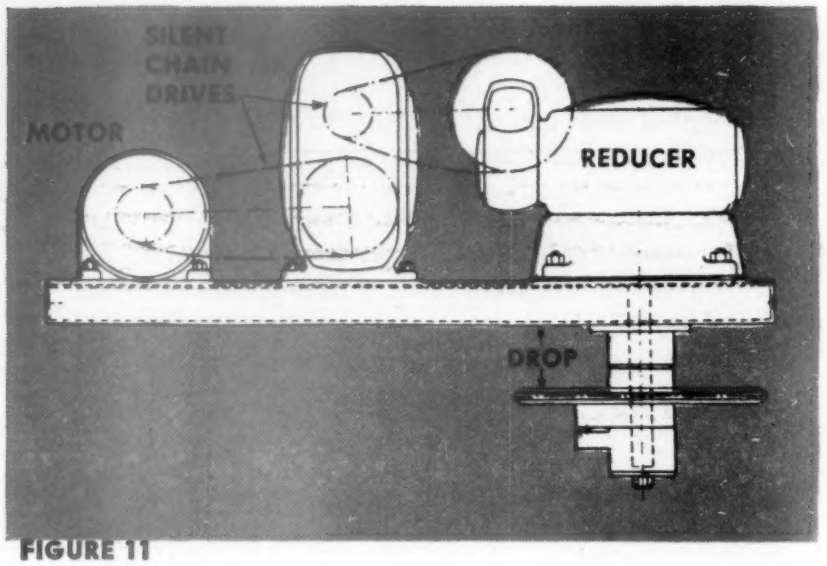


FIGURE 11

CONVEYOR DRIVES

Note, however, that when a sprocket of, say, 12-in. pitch diameter is used with the same drive, the resulting calculated chain pull of 6000 pounds may be too great for the strength of the drive shaft.

CATERPILLAR DRIVE. The caterpillar drive employs a short loop of auxiliary drive chain, alongside of and parallel to the conveyor chain. Back-up bars or rollers on the caterpillar side, and rollers on the drive chain side, confine the chains and prevent them from separating. A caterpillar drive can be located on any straight run of conveyor.

Caterpillar drives are rated for chain pull only, since only one size of drive sprocket is used for each type of conveyor chain.

Advantages of Caterpillar Drives. While sprocket drives are frequently used, caterpillar drives have many advantages.

1. The caterpillar drive can be located in the best spot to take care of chain pull, such as the middle of a straight run.

2. With multiple drives the total chain pull can be more evenly divided between caterpillar drives.

3. If load conditions change, or if the conveyor is altered, a caterpillar drive is easier to move and relocate, without changing the existing conveyor.

4. When chain pull exceeds 2,000 pounds, a caterpillar drive usually is less expensive than a sprocket drive, because of lower torque requirements.

5. A caterpillar drive can be re-used on any conveyor, regardless of the radius or angle of horizontal turns. With a sprocket drive, the load clearance will be limited by the maximum diameter of sprocket used.

CONSTANT and VARIABLE SPEEDS. Both sprocket and caterpillar drives employ the same basic drive mechanism. These come in three different styles: (1) Constant speed; (2) variable diameter pulley with speed variation of 3:1; (3) full variable, with speed variation up to 10:1 or more.

1. Constant Speed. Constant-speed drives use a V-belt or silent chain drive from the motor to a vertical worm gear reducer. The output shaft of the reducer may carry the conveyor sprocket. More often it is connected by a spur gear reduction to a driveshaft, preferably with anti-friction bearings, on which the conveyor sprocket is mounted. This sprocket may be either the one that engages the conveyor chain, making a sprocket drive, or it is the drive sprocket of a caterpillar chain drive.

2. Variable-Diameter Pulley. A variable-diameter pulley drive unit is arranged the same as the constant-speed type, except that a pulley of this type is used instead of a V-belt or chain drive between the motor and reducer. The ratio between maximum and minimum speeds is 3:1 for motors rated up to 5 hp., 1740 r.p.m., and 2¾:1 for 5-hp., 1160-r.p.m. motors. If a larger motor is required it is better to use the full-variable drive unit.

3. Full Variable. In the third style, a variable-speed transmission, or a P.I.V., is introduced into the drive between the motor and reducer. Connection to the motor is by V-belt or silent chain and from the transmission to the reducer by a silent or roller chain drive. The silent chain will be quieter at high speeds, which may be as much as 1300 r.p.m.

GEARS. Final gear reductions are commonly used between the speed reducer and the conveyor driveshaft, although one manufacturer uses a roller chain. Oldstyle drive units used bevel gears for the final reduction. These often caused trouble, and are no longer in favor.

Gear reductions should be cut-steel spur gears, with the pinion heat-treated for strength and long wear. They run at very slow speeds, and therefore usually operate in the open. There has been a tendency in the past few years to enclose these gears, and run them in oil. One company has standard drives with enclosed gears; another has eliminated the gear step by using high-ratio combination worm gear re-

ducers; with the drive sprocket mounted on the extended reducer shaft.

Fabricated steel frames are used to mount the drive machinery, and to support the conveyor track.

SPEEDS. Conveyor speeds can be obtained from a fraction of an inch per minute, up to 50 f.p.m., or faster. Drives for very low or very high speeds, and for very large chain pulls, are specially designed. Standard drives usually can meet other requirements.

Drive ratings should have an allowance for momentary 100 per cent overloads.

MOTORS. Drives for trolley conveyors are powered by individual electric motors. The a.c. squirrel-cage motor is most frequently used. It is easily obtained, can be started across the line, and both motor and control are inexpensive and require very little maintenance. It is common practice to use oversized motors to get high starting torque, and as a protection against overloads and heating.

The oversized motor also has a reserve for the increase in chain pull if a conveyor is lengthened.

Wound-rotor a.c. motors seldom are used. They are not suitable for variable-speed drives, because they do not have inherently stable speed characteristics when the load varies.

Synchronous motors offer no advantages, and for multiple drives do not have the flexibility that is necessary for load sharing.

When direct current is available, compound-wound motors are used both for constant and variable-speed drives. The speed of the motor itself is varied, eliminating the mechanical speed changer required in a.c. drives. The best method of varying the speed of d.c. motors driving conveyors is to use variable-voltage control—especially with multiple drives.

MULTIPLE DRIVES. When the chain pull of a conveyor is too great to be handled by a single drive, two or more drives are used. Additional drives can be added when a conveyor is lengthened, or when the chain pull is increased.

The application of multiple drives presents several problems whose solution is not always easy.

For example, the problem of matching drive speeds is complicated, even for constant speed. No two strands of chain of equal length will have exactly the same number of pitches. Thus a 1000-ft. strand of chain may have 2970 pitches, and the next 1000 feet will have only 2950 pitches. The same length must pass each drive at the same time, but the drive sprockets (whether in a sprocket or a caterpillar drive) have equal numbers of teeth and advance equal numbers of chain pitches per revolution.

Thus each drive turns a different number of revolutions for each phase and section of chain. This requires a continuous "hunting" action of the drives, so that they will keep in proper relationship, and will not tend to tighten or loosen the sections of chains they pull.

In practice, the drives should be located for equal chain pull (as nearly as possible) rather than equal conveyor length, so that length is another variable.

Again, motors do not run at exactly the same speeds, even when load conditions are identical, and loading is always a variable factor.

Constant-Speed Multiple Drives. For constant-speed drives, high-slip squirrel-cage motors are used. These motors slow down under heavy loads or tight chains, speed up under light loads or loose chains. If a large number of drives are required, it is advisable to keep chain pull under 2000 pounds.

Standard squirrel-cage motors may be used with hydraulic couplings, but this combination is more expensive than the high-slip motors alone.

Any of the variable-speed drive combinations can be used also for constant-speed multiple drives.

Variable-Speed Multiple Drives. The floating drive, and the torque-control drive can be used for multiple-drive installations where the speed must be varied.

The frames of floating drives are not fixed, but are mounted on rollers so that they can move on a line parallel to the conveyor chain. The movement is restrained by springs. When the chain pull increases, the drive compresses the springs, and a linkage mechanism reduces the drive speed. Conversely, when the chain pull decreases, the springs move the drive in the opposite direction, speeding up the drive. All the drives on a conveyor are thus kept in step.

Torque-control drives employ a final chain step between the reducer and drive shaft. A linkage introduces a bend in this chain. The bend alters with variations in chain pull, moving the linkage connection to the variable-speed mechanism which changes the drive speed.

Under an overload, the movement of the floating drive, or of the linkage of the torque control, exceeds the normal limit, so that a limit switch is engaged which stops all the drive motors. Removing the overload allows the drives to be started again immediately.

Where the speed is controlled manually, a change at one drive will automatically change the speed at the other drives, within the range of the control. Beyond that limit, the drives must be adjusted individually. With mechanical or electric operation of the speed adjustment, it is possible to vary the speed over the entire range from a central point.

Direct-Current Drives. Direct-current, adjustable-speed motors with inherently stable speed characteristics, are used for multiple drives where the speed must be varied gradually over a considerable range.

One type of d.c., variable-speed drive uses variable-voltage control. This system converts alternating to direct current, which drives special conveyor motors. They have the high slip characteristic needed to maintain speed- and load-sharing synchronization.

The conversion unit may be electronic or rotating. Through interlocking of the controls all conveyor motors function as one machine. Speed setting of the entire conveyor is controlled through a separate rheostat. Each drive provides an 8:1 speed range.

A control panel provides means for determining and equalizing individual motor loads, and consequent closer synchronization of the entire conveyor drive from one central station.

GURE 12

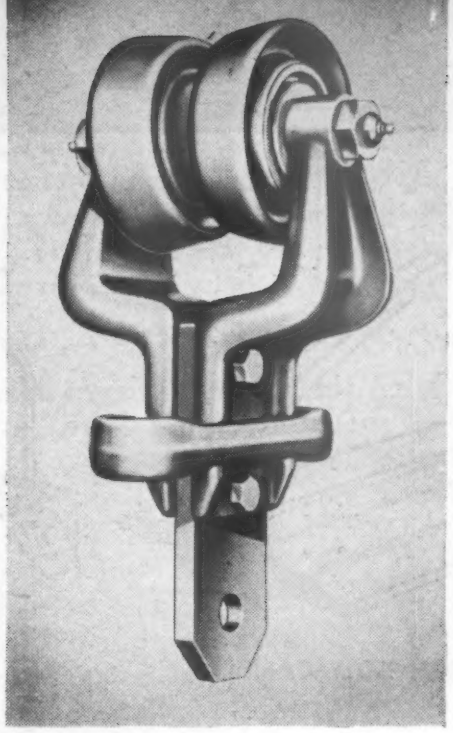


FIGURE 13

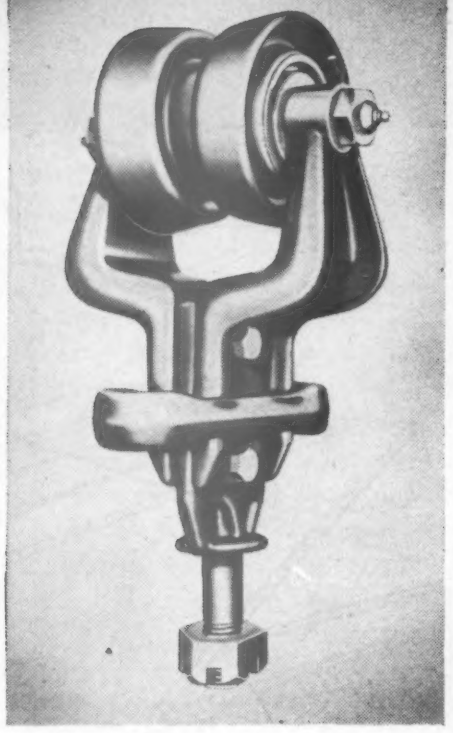


FIGURE 14

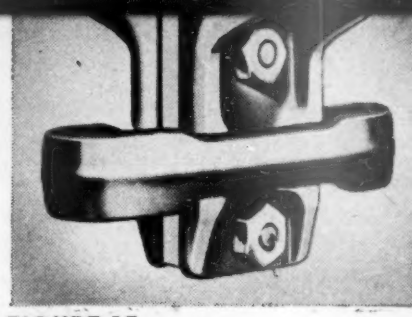


FIGURE 15

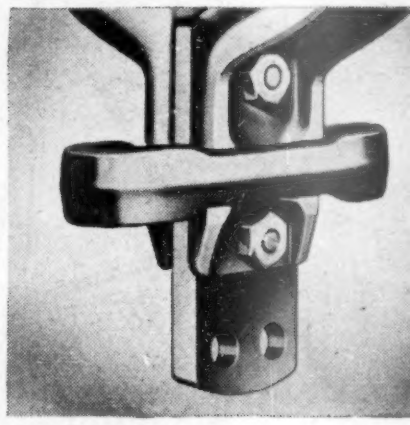


FIGURE 16

5. ATTACHMENTS AND CARRIERS

ATTACHMENTS. Chain and trolley attachments are the means for suspending loads from the conveyor. Heavy loads should always be carried by the trolleys. Light loads, and towing and pushing attachments, can be hung from the chain. Both standard and special attachments are illustrated.

Attachments in general use, easily available, and considered standard, include:

H – clevis attachments
C – pendent or eye attachments
B – rod attachments
I – idler or dummy attachments
P – attachments
E – ring attachments
load bars

The *H*, *C*, and *B* types are found in both chain and trolley attachments. Idler attachments are used only with trolleys. Ring attachments usually are extended chain pins. Load bars are connected to either *H* or *B* trolley attachments.

The clevis attachment, Figure 12, is used more than any other. It is an easy and inexpensive way to suspend the load, which hangs in a vertical position at all times. The connection of the tongue of the carrier, in the clevis and on the clevis bolt, should be a loose fit. This allows a load, even if off center, to hang with its center of gravity directly below the center line of the track, preventing eccentric trolley loading.

The pendent attachment, Figure 13, is used when removable *J* hooks carry the loads. The hole in this attachment is made large enough to allow the *J* hook to be easily connected, or removed.

Rod attachments, Figure 14, are used in pairs, in combination with a load bar, to carry loads too heavy for a single trolley. This combination is also used on steep inclines, or vertical runs to prevent kinking the chain.

Idler or dummy attachments, Figure 15, are used as intermediate chain supports between widely spaced loads. They are neat and slightly less expensive than clevis attachments. Some users, however, prefer clevis attachments at intermediate trolleys. These will allow respacing of loads without changing attachments. Also clevises can be salvaged for reuse to better advantage than idlers.

The P attachments, Figure 16, are used when carriers must be rigidly connected to trolleys. Each attachment has two bolt holes for this connection.

Ring attachments have larger openings than eye attachments. They are used in connection with towing hooks on warehouse trucks.

Load bars, Figure 17, have already been mentioned in connection with rod attachments. They can also be hung from clevis attachments by using pins or links. Although mainly used to divide the load on trolleys, they are also used in other ways.

CONNECTION TO TROLLEYS. Trolleys and attachments are a loose fit in the center links of drop-forged

FIGURE 17

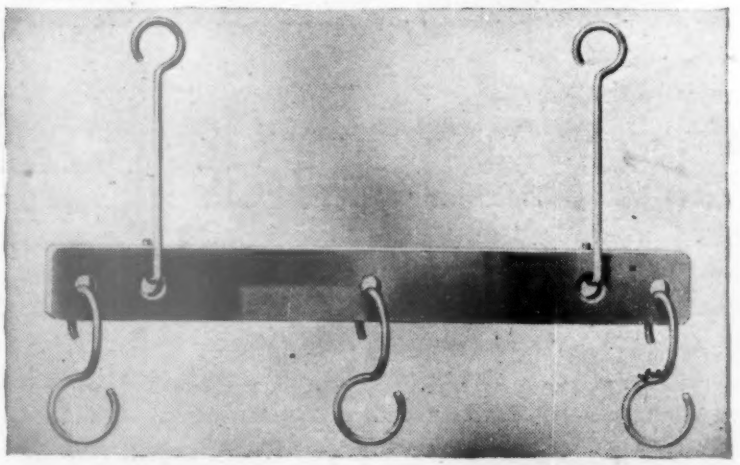
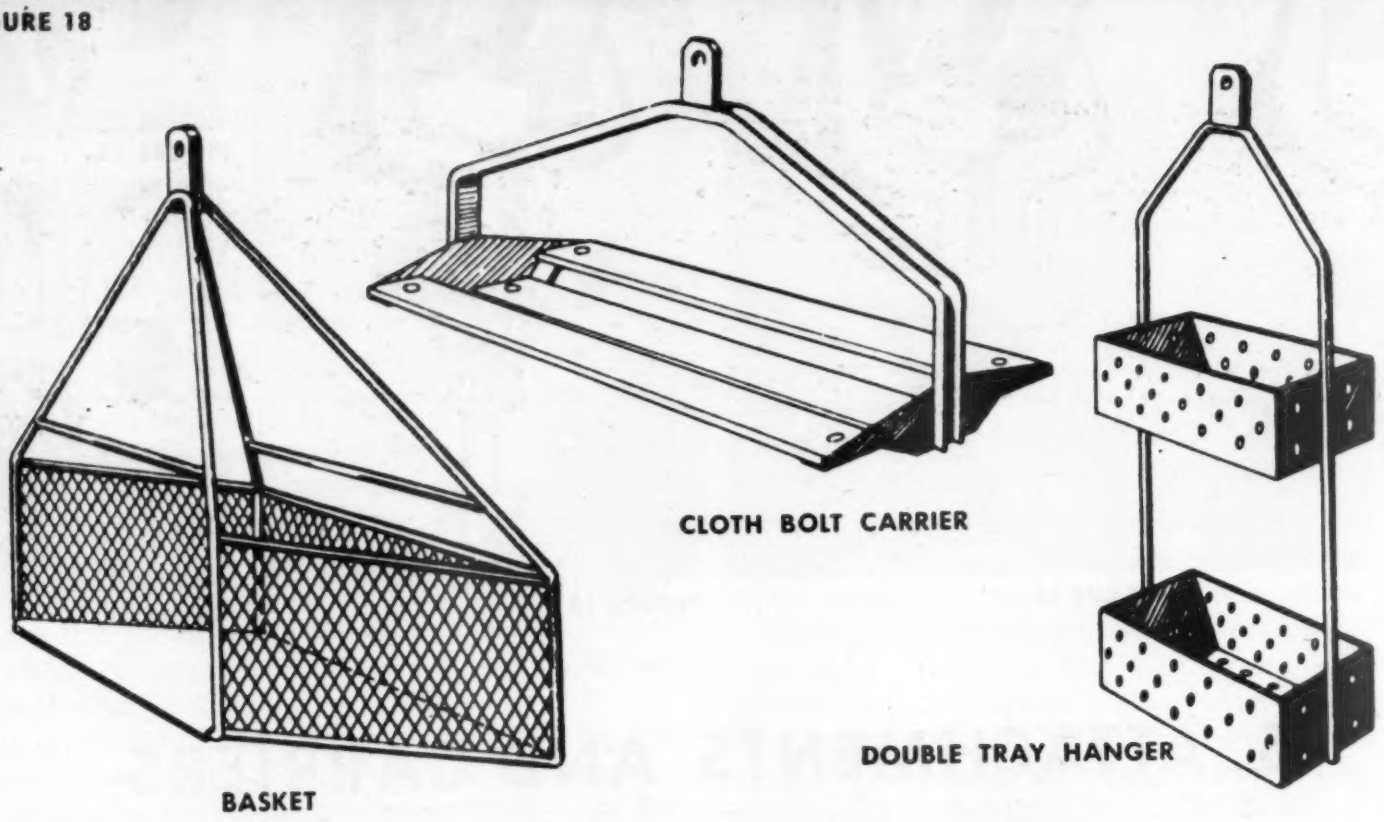


FIGURE 18



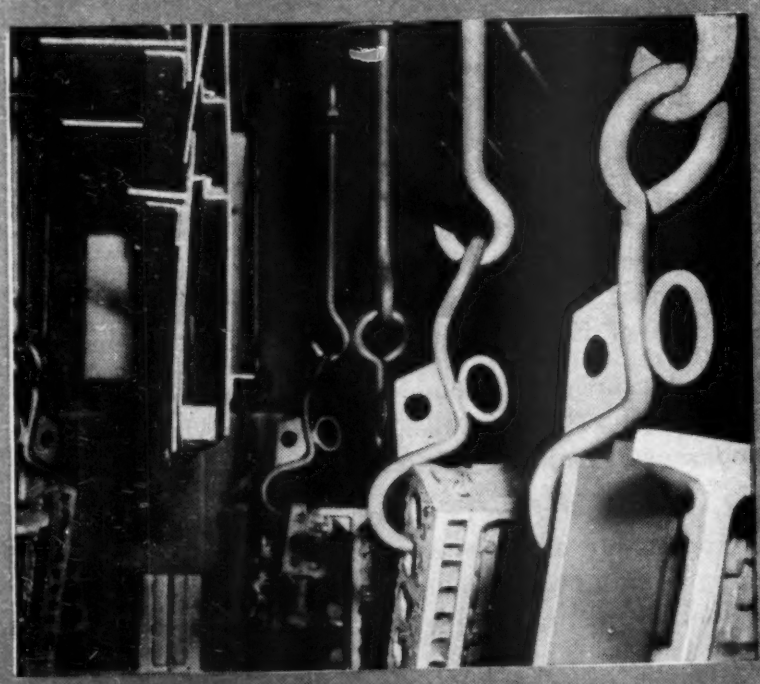


FIGURE 19

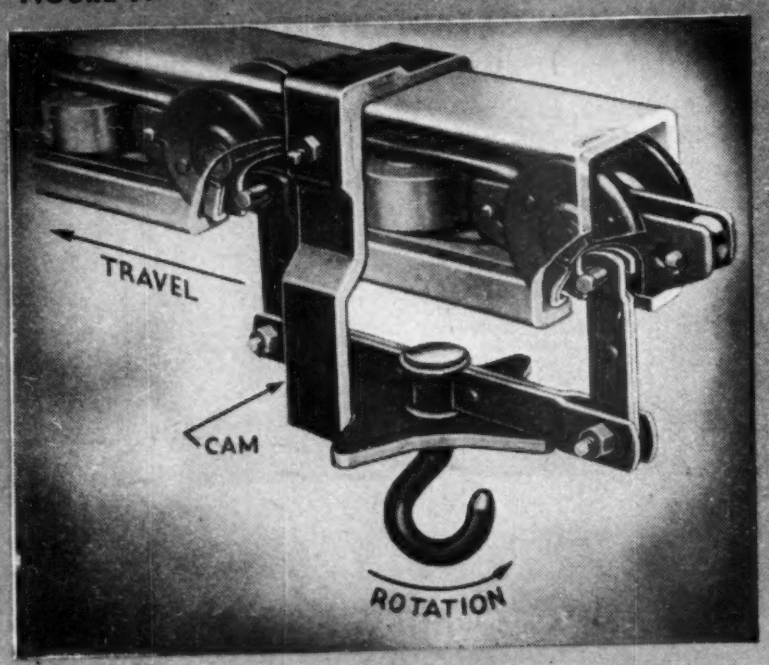
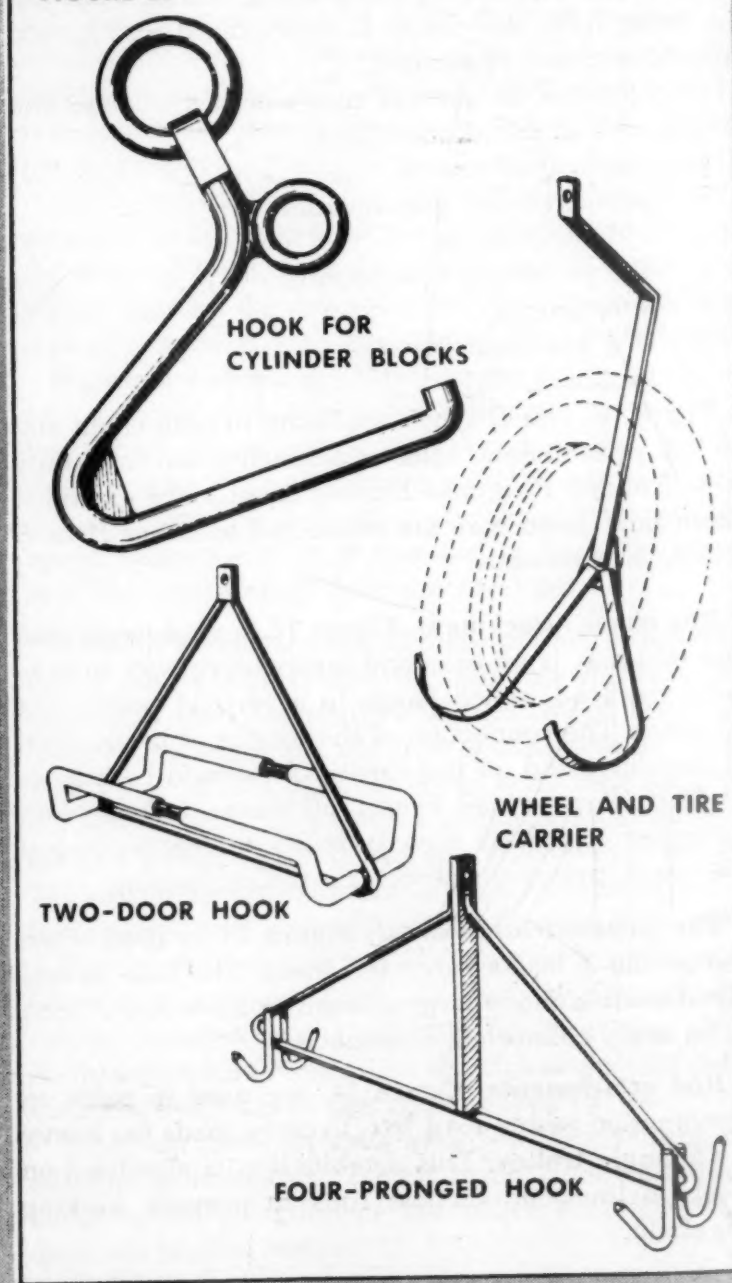


FIGURE 21

FIGURE 20



rivetless chain. This makes a flexible connection, allowing trolley wheels to bear equally on the track, and preventing twist or kinks in the chain at dips or when loads are hung off center. On other chains, trolleys and attachments are rigidly bolted to, or are parts of the chain.

CARRIERS. Loads are transported by various types of suspended hooks, trays, racks, pans, baskets or slings. Different types of carriers can alternate on the same conveyors. Figure 18, 19, and 20 are some common and special types of carriers. Two very popular types are suspended trays and J-hooks.

Suspended trays are used when a variety of sizes and shapes of load is carried on a conveyor. These loads must be either in carton form, or shaped so that they will be stable while handled. Suspended trays can have multiple shelves. Very heavy trays with grid rack shelves are used for drying and baking cores.

So-called J-hooks are shaped like fish hooks without barbs. They vary from very light wire hooks to the giant sizes for handling very heavy loads. When loads are too heavy to be handled manually, hoists are used to load and remove them from the conveyor. Auxiliary rings, hooks, or plates with holes are then provided on the main hooks, to hang the loads on the hoists.

Multiple hooks are designed to carry more than single loads. The loads can be alike, or different. Some hooks are shaped like inverted trees, and are called Christmas tree hooks. They are useful for carrying objects like gear pinions.

Swivel hooks, Figure 21, are used when loads must be turned without removing them from the conveyor. The turning may be manual or automatic. Positioning lugs can be provided to keep the loads from turning between stations.

CARRIER DESIGN. The design of a carrier is usually a cut-and-try affair. While symmetrically shaped carriers are the easiest to design, this should not deter the use of non-symmetrical types. The best way to tell whether a carrier is suitable is to make a sample and try it out.

One basic rule to follow is that the center of gravity of the carrier, empty or loaded, must hang in the vertical plane of the center line of the conveyor track. Therefore trays and multiple hooks suspended from clevis attachments must also have a chance to swing laterally when loaded eccentrically.

Hairpin-shaped hooks, pans, or trays, loaded from the side, front, or back, should be counter-balanced to hang level when empty, to make them easier to load or unload. The balanced hook will also require less clearance, which is important in determining the dimensions of guards.

MATERIALS. Carrier frames are made of steel rods, channels, angles, and plates. Other materials are wire mesh, wood, brass, aluminum, felt, rubber hose and sheets, and sprayed rubber coatings.

APPLYING RUBBER HOSE. One of the protective coverings commonly used is auto heater hose which is cheap and plentiful, and built to stand heat and abuse. It is sometimes difficult to apply over long, bent rods. One method is to use soapy water as a lubricant. Another is to apply low pressure air (2 to 5 pounds gage) at one end of the hose, after starting the other end on the hook. Opening the air valve inflates the hose slightly, which helps when forcing it on.

A third method is to heat the end of the hook to a dark cherry red, and force the hose over the hot rod. The lining of the hose melts, and acts as a lubricant. This method damages the hose, reducing its life, but may make it possible to cover hooks that cannot be covered by other methods.

6. GUARDS AND RUNAWAY STOPS

SAFETY practice calls for the use of guards wherever high conveyor lines pass over the heads of workers, or when there is any danger that loads will cause injury or damage should they fall off the carriers because of improper loading. While such a mishap could occur anywhere, low conveyor runs are very seldom guarded.

Trolley conveyors operate at such slow speeds that it is considered safe to walk between loads to pass from one side of the conveyor to another.

REQUIREMENTS. The ideal guard not only should prevent a load from dropping on someone below, but should also allow enough room so that moving loads will clear a fallen load resting on the floor of the guard. In practice, there is seldom enough headroom to provide so much clearance, and the cost of the larger guard would be excessive. The clearance between the loads and the bottom and sides of the guard is seldom more than 6 inches, and may be only 2 inches for small, light loads. Clearances must be enough to keep swaying or tilted loads from hitting or dragging on the sides or bottom of the guard.

Guards must be carefully laid out to provide these clearances. This feature is very important at turns and dips.

Guards are usually made of woven wire mesh or expanded metal, to offer the least obstruction to light and to make the guards as light in weight as possible. Drip pans are used to keep oil or dirt from dropping on workers or equipment. They are also used following paint or other dip tanks to catch drip from loads, and if possible to allow it to drain back to the tanks.

Guards have also been made of spaced wood planks,

or of plywood. These constructions are not only quite heavy, however, but also cut off too much light.

When a conveyor drops down to a work station, the guards follow the dips down from the high lines until the bottom clearance line of the guard framing is 6½ feet above the floor. This height is in general use, since it provides walking head room under the conveyor.

In some plants, where this height is considered not safe enough, additional protection is furnished by installing pipe handrails around the lower curves of these dips. Then if any load falls on an inclined guard, it will roll down into a guarded space on the floor.

Safety guards are quite expensive, and have been known to equal the cost of the remainder of the conveyor. The guard structure and mesh should be designed only for protection, and not for structural rigidity. It is much cheaper to replace occasionally a piece of guard damaged by a falling load, than to build it strong enough to resist damage that will occur in only a few spots.

It is advisable to make the construction as simple as possible, and to see that guards are specified only where they are necessary.

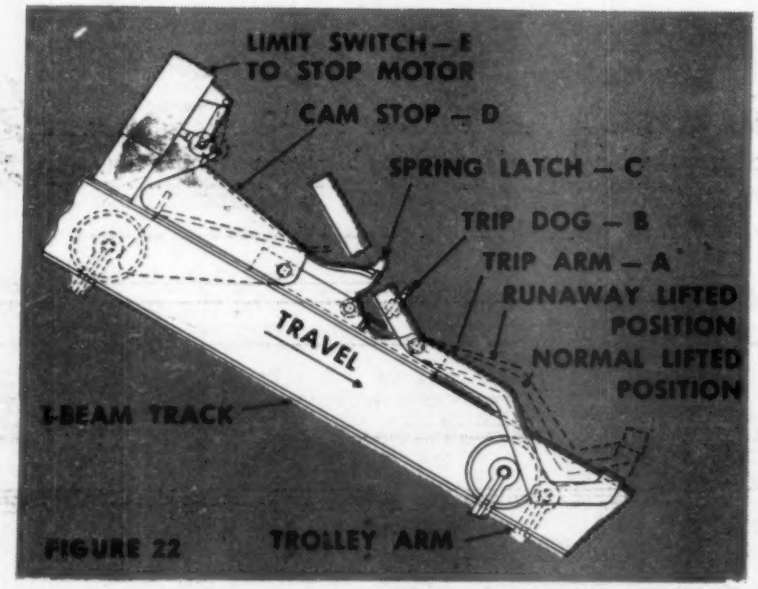


FIGURE 22

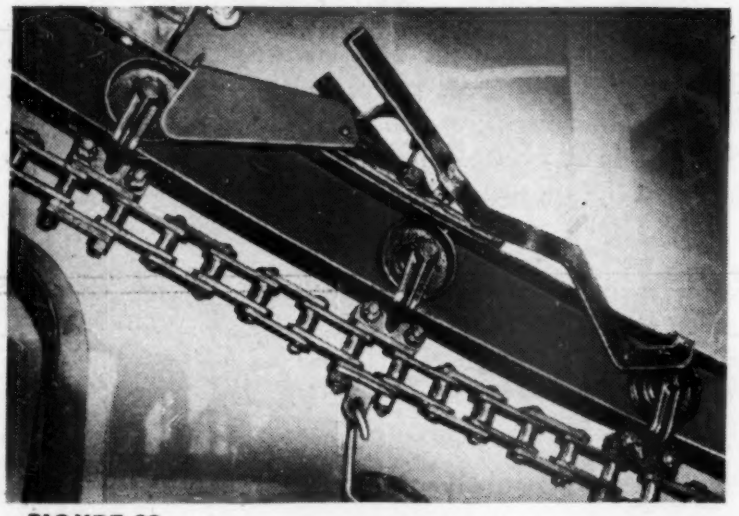


FIGURE 23

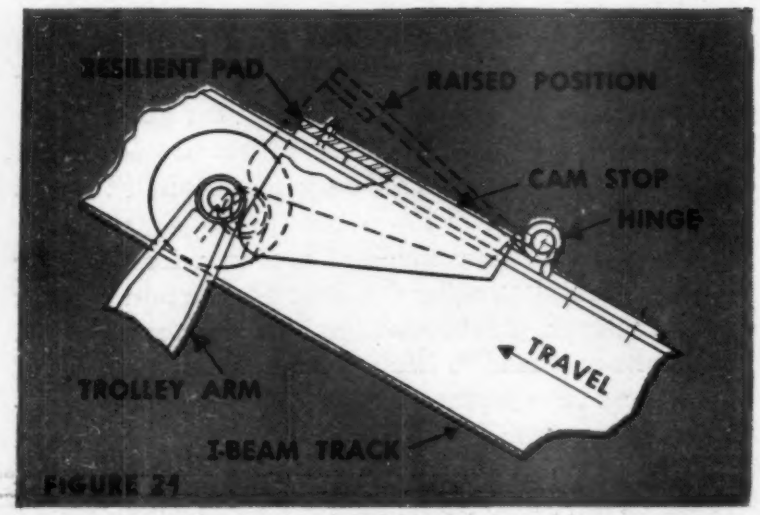


FIGURE 24

RUNAWAY STOPS. If a conveyor chain breaks on an inclined run of considerable height, the moving conveyor parts can run down the incline at a comparatively high speed. In some plants, to prevent damage to persons or property, runaway stops are installed at such dips. One stop is usually provided for each 10-ft. change in elevation, and located where it will be most effective.

Down-hill stops are of the general construction shown in Figure 22. Trip arm *A*, in normal operation, is raised and lowered gently by each trolley arm. If the chain breaks and the loads increase their speed down the inclined track, the trolley arms will hit trip arm *A* much harder, causing it to raise to the "runaway lifted position." Then trip dog *B*, which is rigidly fastened to *A*, will cause spring latch *C* to release its serrated tooth connection with cam stop *D*, which will drop by gravity behind a trolley, stopping the runaway. At the same time, this will release the operating arm of limit switch *E*, stopping the conveyor motor.

This stop can be used also as a runaway stop for an up-hill run, when it is desired to stop the motor when a chain breaks. Figure 23 shows one of these stops in the normal, or untripped, operating position.

Up-hill stops are of the general design shown in Figure 24. The construction is simple, consisting of a hinged cam stop, which is raised by each trolley, and drops down behind the trolley arm as it passes the cam. Reverse movement of the conveyor, for any reason, will be prevented by the stop.

CHAIN AND TROLLEY GUARDS. When conveyors are exposed to the weather or are run through spray painting or washing booths, sandblasting, degreasing, or other places where the chain and trolleys may be damaged, guards can be used to protect them. The general method is to enclose the chain and trolleys as effectively as possible. In some cases, forced air ventilation, under a slight pressure, is used in the enclosed space to prevent the entrance of fumes from the processes.

Traveling Seals. Another type of protection to chain and trolleys involves the use of traveling sealing plates to protect them from excessive heat. This type of construction allows the chain and trolleys to travel in the open air above the top of the furnace. The loads hang on rod attachments that travel through a slot in the top of the furnace. Sealing plates are connected to the rods, and travel with them, closing the slot, and preventing the escape of heat.

Traveling seals are also used to protect chain and trolleys from the escape of abrasive dust from continuous sandblasting operations.

FOUR-HOUR INDUCTION SCHOOL GIVES JOB PICTURE TO NEW WORKERS

PARKER C. WILLIAMS • DIRECTOR OF INDUSTRIAL RELATIONS, WHITE MOTOR COMPANY, CLEVELAND

NEW employees at White Motor get off to a good start. They attend an induction school that aims to give them, in one afternoon, an understanding of the company's history, policies, and activities. The popularity and effectiveness of this course may be measured by the fact that departmental supervisors are currently sending their older employees to the school.

Attendance at the school generates in the new employee's mind the conviction that the company has a personal interest in him. While the school does not try to answer all the questions that may arise on his new job, it does tell him where he can go to get the answers.

Interviews are completed in the morning. Successful applicants go into the induction school that same day. The training period lasts from 12:30 p.m. to 4:30 p.m., and attendance is at company expense.

INTRODUCTORY SESSION. In the first half of a 60-minute introductory session, new employees are welcomed into the White organization. The instructor introduces each person to the group, mentions the department he will work in, and requests that he respond with a few words about his previous work or military experience. This brief introduction serves to acquaint a new employee with the others in the training class.

During the next ten minutes, the instructor points out that the purpose of the school is to get acquainted with each other and with the plant, learn about the history, war contribution, policies, and future of the company, and hear from some of the staff members.

In the remaining minutes, the group is shown a specially-prepared sound motion picture film about the company, "The Road Ahead."

PLANT TOUR. At 1:30 p.m., the group makes an hour's tour of the various operating departments of the plant. Older employees are often amazed to see departments they never knew existed, and take pride in seeing the parts they have made being fitted into the assembly.

SHORT TALKS. Back in the classroom after a brief intermission, short talks are given by the nurse, safety engineer, and suggestion supervisor.

The nurse discusses the "how" and "why" of obtaining a pass from the foreman to visit the hospital, and explains the necessity of making out a report of any accident. She lists the injuries or ailments that require immediate attention, tells who the plant physician is and when he is on duty. She cautions that a factory injury should be reported first to the dispensary before consulting the family physician in order to expedite the handling of a possible compensation claim. She also stresses the necessity for the employee's calling in to the plant when he cannot report for work. Her cautions have practically eliminated the necessity of tracing employees who fail to report off for illness or other reasons, and have facilitated arrangements for substitutes for the absent workers.

The safety engineer's talk is centered around "how not to get hurt." He reviews a group of accidents and analyzes them, showing how each is studied by the safety department to eliminate the possibility of recurrence. Although many factors have a bearing on the safety records, the usefulness of this talk has been proved by the fact that during the first year it has been given, minor accidents have been reduced by 50 per cent. At the same time, there has been a reduction in frequency from 16.3 to 13.5, and in severity from 1.74 to 0.644 on lost-time accidents.

The suggestion supervisor points out the opportunity for employees to suggest new and better methods for White. He also explains *what* they may expect to receive for a usable suggestion, *how* the suggestions are investigated, and *why* it is that occasionally a seemingly good suggestion must be rejected. As a result of this talk, suggestions submitted have jumped from 35 to over 150 per month.

Ten additional minutes are required for showing slides of the executives and department heads of the company. The instructor explains their background and functions in the company.

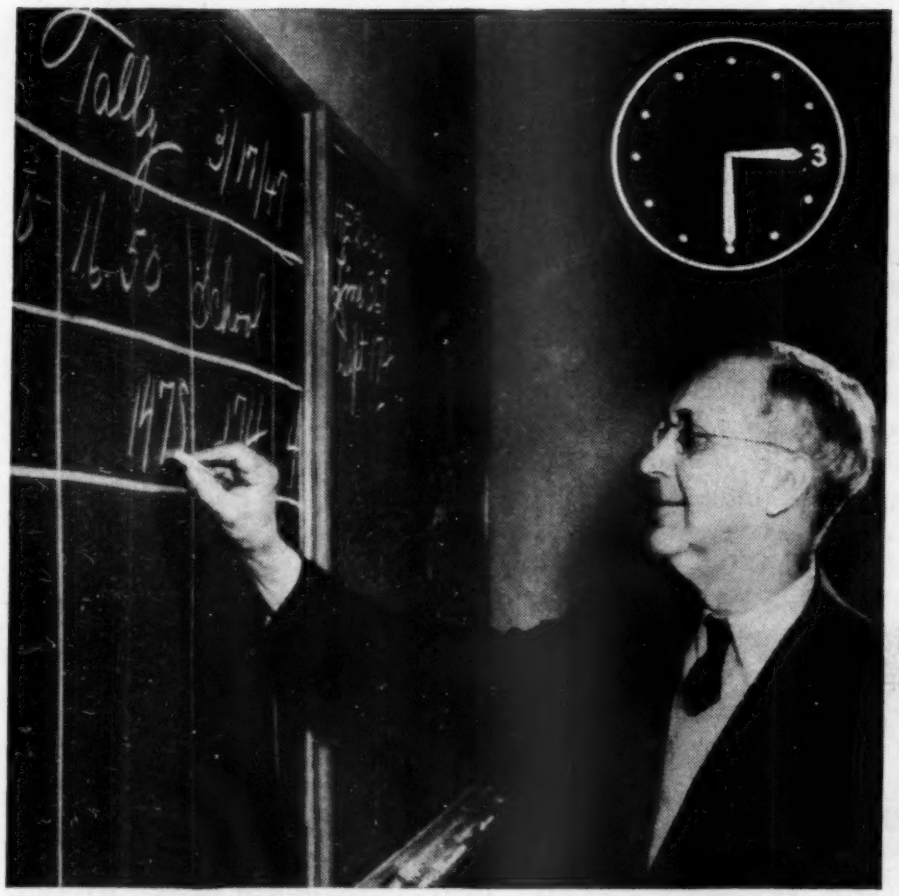
A 10-minute movie of an inspirational or travel nature follows this, as relaxation for the group before the program continues.

FINAL SESSION. The last session touches on the more detailed and personal aspects of the employee's relationship with the company.

The hiring slips given each successful applicant list details such as his department and clock number. These are explained, as well as the tally on which he records daily production for pay purposes.

A discussion of the functions of the plant protection department follows. Shifts and work hours for office and factory personnel are included, along with the regulations

PLANT TOUR SHOWS NEW EMPLOYEES OPERATIONAL SETUP. OLDER EMPLOYEES SEE PARTS THEY HAVE MADE BEING PUT INTO ASSEMBLY



FINAL SESSION covers details of work routine. Here tally sheet, used for recording daily production, is explained, showing how pay is figured

FOLLOW-UP VISITS from personnel office make new worker feel at home, help determine job fitness

TEN-MINUTE DISCUSSIONS COVER THE EMPLOYEE SUGGESTION SYSTEM, COMPANY HEALTH REGULATIONS, AND SHOP SAFETY RULES

concerning parking of cars and punching of time cards. The use of locker room facilities and canteens is mentioned, and the questions of payday, the credit union, and vacations are gone over in detail.

The sickness benefit system is fully described. For those employees who desire to participate, a small weekly payment is required for a benefit amounting to $16 for 26 weeks and $13 for 26 additional weeks. There is also a $500 death benefit. In addition, participation in the plant hospitalization policy is urged.

Finally, the importance of reading bulletin boards is stressed. It is explained that these boards contain information of interest to the employee and that he is held responsible for observing regulations posted on them.

Each student is given a suggestion blank with the request that he indicate any ideas he may have for improving the course. Certain parts of the program have been altered as a direct result of these student suggestions. At the end of the class, he receives an envelope containing two recent issues of the company publication, *White Reporter*, two safety pamphlets, and an employees manual entitled "Your Job," containing miscellaneous information.

INTRODUCTION TO JOB. As important as the induction course is, the fact remains that the new employee is not then forgotten. When he reports to work at the employment office the following day, he is given his badge and conducted to his department, where he meets his foreman again. He had first met him during his initial interview.

The foreman shows him the department canteen and the washroom. He also assigns him locker room space and explains the regulations in effect there. Next he meets the timekeeper, who shows him how and where to clock in and where he must obtain and deposit his work tally sheets. The foreman introduces him, too, to the set-up men, the stockkeeper, and the men on neighboring machines. He explains that if the new employee has any questions he will be glad to get the answers for him. This not only shows the man that his questions will receive attention but also establishes in his mind the foreman's authority.

He is then assigned to his own machine, and starts his work.

FOLLOW-UP. During the first four weeks of employment, department interviewers call on the new man and his foreman from time to time to see how he is progressing, and how he likes his work and environment. From this contact, the interviewer attempts to determine the permanency of the assignment.

UNIT No. 12 MACHINE R-3 MACHINE DIVISION ROLL MACHINE SLITTER KNIVES

DATE CHANGED OR REPAIRED	ACTUAL DAYS	COMMENTS	CODE	MECHANIC	PART NAME
12-17-46		OVERHAUL			FULL SET OF NEW KNIVES
					INSTALLED (OHIO BLADES) No. 14
1-15-47		REGROUND H.E. KNIVES			
		REPLACED	4009		1 SPRING COLLAR
		REPLACED	101		1 STREAMER KNIFE SPRING
2-11-47		OVERHAUL			HAMPTON STEEL BLADES INSTALLED
					ON R.E. 1st AND 2nd KNIVES
2-11-47		OHIO BLADES REGROUND AND PUT BACK (No. 14)			
5-23-47		OHIO BLADES REGROUND AND PUT BACK (No. 14)			
8-20-47		REGROUND H.E. KNIVES			

STEP 1 — TWO CROSS-INDEXED EQUIPMENT RECORDS REVEAL WHAT IS HAPPENING TO A PARTICULAR MACHINE (LEFT) AND WHAT IS

TEN-STEP UPKEEP IN A NON-STOP

1. SET UP EQUIPMENT RECORDS
2. INSTALL AREA MECHANICS
3. ESTABLISH WORK SCHEDULES
4. IMPROVE MACHINE DESIGN
5. PLAN SHUTDOWNS
6. WORK CLOSELY WITH ENGINEERING
7. SET UP SPECIAL SERVICE SHOPS
8. IMPROVE MAINTENANCE SHOP
9. ADD PARTS-CONTROL ENGINEER
10. SET UP SPARE-PARTS CONTROL

HENRY S. GODSHALL, JR. • MAINTENANCE ENGINEER, SCOTT PAPER COMPANY, CHESTER, PA.

BEST utilization of men and machines calls for reliable scheduling of production operations. Accurate scheduling of production, in turn, depends so much upon close control of machine downtime that it, too, must be scheduled. Unexpected electrical and mechanical failures must be reduced to the point where they become a negligible factor in over-all operations.

All this is important in any plant; it becomes vital in a plant like Scott Paper which runs 24 hours a day, 7 days a week. And Scott has been able to do it by putting into practice the principles of preventive maintenance and by regular planning of maintenance work.

This achievement involved a ten-point program of improvements in organization and methods to eliminate the causes of unscheduled machine downtime. In setting up the program, the changes were made gradually over a period of several years, so that each phase could be assimilated and made to work as it should, and give no cause for failure of subsequent moves.

PART No. 14
INSTALLED

Every change, repair, or modification of a machine is posted to both records. Folded duplex parts-record (right) shows installation data on outer tab (top), and service data under the flap (bottom)

PART No. 14
SERVICED

CARD FOLDED

MACHINE	DATE INSTALLED	DATE REMOVED	
12-R-3	12-17-46		

PART No. 14 PART ROLL MACHINE KNIVES

CARD OPEN

DATE		
2-11-47	BLADES REGROUND AND PUT BACK	
5-23-47	BLADES REGROUND AND PUT BACK	

PART No. 14 PART ROLL MACHINE KNIVES

PLANT

STEP 1. *Set up equipment records.* The first step was an analysis of all plant equipment to establish a procedure for prevention of machine failure. This was begun in the finishing department, which had been faced with frequent breakdowns and disruptions of schedules. This department was a practical starting point because it is made up of many small individually operated machines, hence one, two, or a group of these machines could be taken out of service for a short period of time without seriously affecting the over-all plant operations.

STEP 2. *Install area mechanics.* Concurrently with the first step, each production department head was made fully responsible for maintenance of equipment under his control. To implement this, a system of departmental mechanics was set up, whereby one mechanic was assigned to each paper machine, and a small crew of mechanics and a supervisor were assigned to each of the other operating departments. These men replaced the plant-wide millwright crews which were responsible only to the master mechanic.

These "area" mechanics are responsible for regular inspection and lubrication of all equipment in their department. To facilitate their work and to insure proper performance, daily, weekly, and monthly checklists were prepared for both lubrication and inspection of all equipment. These lists have made it possible (1) to control the performance of these men, (2) to isolate defective equipment prior to actual failure so that remedial measures can be taken to prevent breakdown or serious damage, and (3) to eliminate many previous sources of trouble through proper lubrication.

In addition to these duties the area mechanic makes adjustments and running repairs which keep equipment in service. At regular intervals they overhaul certain designated units, such as pumps. These men have become specialists on their own equipment, hence are best

qualified to evaluate its performance. Of real importance has been the creation of a personal pride in the operation of their equipment, since they are charged with the responsibility of seeing that it functions properly.

As an integral part of maintenance planning, these men are the source of basic information used in effecting prompt repairs.

Since area mechanics are assigned regularly to the first shift, they are supplemented by a crew of oilers on the second and third shifts, one in each department, to provide round-the-clock coverage.

In order to establish the necessary facts, each machine and each of its integral parts or subassemblies was given a departmental ledger number for identification. A cross-file was set up which consists of (1) a card for each basic machine section of each production unit, and (2) a card for each of the numbered parts or subassemblies in these sections (see pages 120 and 121). On the first group of cards is posted the nature of all repairs, replacements, or changes made to the machine sections. Similar entries are made on the second group to show the life history of each part or subassembly.

ROLL MACHINE OVERHAUL

MACHINE No. **10-R-4** DATE **JUNE 6, 1947**

DESCRIPTION	IN	OUT	MECHANIC	REMARKS
1. Change full set of knives				O.K.
2. Top knife shaft				O.K.
3. Bottom knife shaft				O.K.
4. Front feed roll			WK—JB	COVERED
5. Back feed roll			WK—JB	COVERED AND NEW R.E. BEARING
6. Cylinder			WK	NEW BRAKE DRUM
7. Severing head			WK	RESET HEAD
8. Drive clutch				
9. Check motor couplings			DC	
10. Clean, grease, and check winder			J B	
11. Check tuber bearings and pulleys			JB-WK	
12. Check tuber motor worm shaft nut				
13. Check water pan breakdown bar			TW	NEW PINS R.E.
14. Check water pan brush bar			TW	
15. Check water for leaking			TW	
16. Inspect spring roll mechanism			BK-RH	NEW SPRING ROLL
17. Check P.R. drive chain			RH	
18. Check P.R. drive assembly			RH	
19. Check P.R. drive fulcrum arms			RH	
20. Check P.R. drive main shaft			NR	CHANGE SET SCREWS
21. Check and clean clock			WK	
22. Check tuber platform chains			TW	
23. Check tuber platform belts			TW	
24. Check crane hoist			TW	
25. INSTALL TUBER CHAIN TAKE-UP SPROCKET			J.W.	

CHECKLIST shows work to be done in a machine overhaul. It also serves as an on-the-spot record of what was done, for posting to the cross-indexed equipment records

STEP 3. *Establish work schedules.* At the end of a six-months period, based on an analysis given by the new equipment records, it was possible to predict the life of each machine part or subassembly, as well as to determine the nature and extent of repairs necessary to prevent failure. A regular overhaul period was then scheduled for each machine, based on the life of its weakest part. A check-list was prepared for each machine, outlining the work to be done during an overhaul.

The equipment records have become the heart of the scheduling program, and continually point up the weak points of each machine. By making changes in weak parts, or in their use, it is often possible to extend their life and thereby lengthen the periods between overhauls. Experience has shown that schedules may be revised in this way, but once established they must be adhered to. When overhauls are passed by, trouble is bound to set in.

STEP 4. *Improve machine design.* Concurrently with development of a preventive maintenance program, the engineering department redesigned all machines in the finishing department. This was a major job, but resulted in standardization of equipment and full interchangeability of parts. By gradually converting all machines to the standard design, overhauls were simplified and shortened by the elimination of custom-made work. It also made possible the setting up of a reasonable inventory of spare parts.

STEP 5. *Plan shutdowns.* These new procedures virtually eliminated recurrent breakdowns and improved machine performance considerably. They made possible both planning for overhauls and scheduling of production and maintenance work on a sound basis.

Application of these techniques was extended to the equipment in various other departments, so that now overhaul periods have been established for most operating units. In the case of the paper mill, this work is tied in with the periodic shutdowns needed for "clothing" changes which have similarly been established on the basis of machine roll and clothing life.

Planning for paper-machine shutdowns now begins several days before a clothing change. The mechanic and operators assigned to that machine make up a list of necessary repairs, based on their inspections. To this list is added the work to be done on those units of the machine scheduled for over-

haul, such as pumps, reducers, and drives. The division manager then meets with representatives of the maintenance department to review the work and to establish the length of time needed for the overhaul. The machine is scheduled "out of production" for this period, and the maintenance department takes over the work. By such arrangements in advance of a shutdown, it is possible to plan for each job and to assemble parts and materials, and thus insure its being accomplished with a minimum of downtime.

For a department such as pulp preparation, where equipment runs continuously throughout the year, individual units are taken out of production regularly for a short period of time to permit inspection and servicing. This is made possible either by having stand-by equipment, or by doing it when a paper machine is out of production, at which time the demand on service by such units may be lessened.

STEP 6. *Work closely with engineering.* Because the maintenance department was given responsibility for handling all work beyond the scope of the departmental "area" mechanics (for repairs as well as overhauls), it had to be set up to perform the type and amount of work demanded by this preventive maintenance program.

The initial step was to make this department an integral part of the engineering division, under the chief plant engineer. By so doing, the maintenance department can get all possible assistance in the way of working drawings, materials specifications, development of new techniques, and engineering service for making repairs properly or for correction of equipment defects encountered. The engineering department has also profited in that it is able to call on the experience of the maintenance men for assistance when designing or altering equipment. Full consideration can then be given to future maintenance.

One of the most effective means found to correlate these two activities has been the simple expedient of a meeting held at the start of each day. This meeting brings together the key men in the maintenance and engineering departments for a free exchange of ideas on their daily problems, past, present, or future, and for a review of work orders. It amounts actually to a broad planning group for maintenance work.

STEP 7. *Set up special service shops.* In order to fulfill its responsibilities most effectively, the maintenance department has been divided into two groups. The electric shop works under the supervision of the electrical superintendent, and the service shop under the master mechanic.

The electric shop is assigned full responsibility for the inspection, lubrication, and repair of all electrical equipment, refrigeration, and air conditioning. Departmental mechanics are not held responsible for this equipment. To render best service, the electric shop correlates its activities with the regularly scheduled overhauls. Whenever a machine or unit is taken out of production for repair or servicing, a crew of electricians completely inspects, tests, and overhauls the electrical installation. Here too a checklist is used for each job to insure proper coverage. Supplementing this regular work, another crew of electricians, one on each shift, inspects and lubricates all electrical equipment while it is running. They also check the recording ammeters on all major units in order to detect and remedy overloads.

The service shop is set up, as the name implies, to render service to any department in the plant. Work is performed only on written order of a department head. A real addition made in this group was that of a shop planner. Under the direction of the master mechanic, he reviews all job orders and makes available all necessary information, material, and parts in preparation for each job. With scheduled overhauls and advance planning it is thus possible to facilitate and expedite all work. Furthermore, the shop planner releases each shop foreman to devote his attention to planning the job itself, to assigning the proper men to each job, and to supervision.

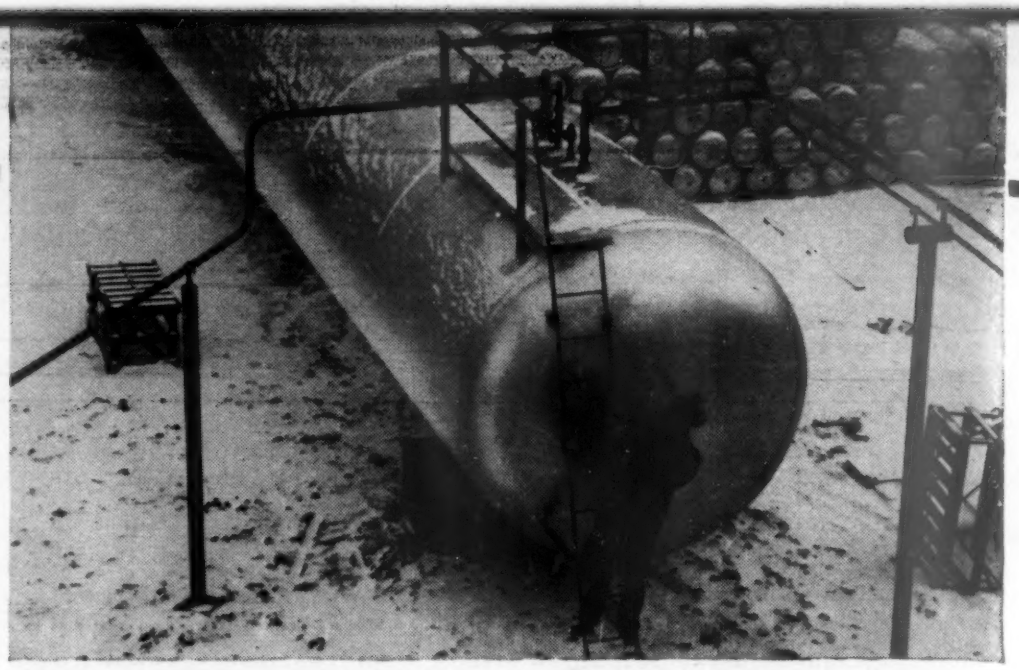
STEP 8. *Improve maintenance shop.* Management has recognized that maintenance is a vital factor in the steady flow of production, and that it must be done on a quality basis. It is also believed that all possible repair work rebuilding, and manufacture of standard parts should be done in the company's shops. On this basis proposed physical changes in the maintenance department were justified.

A paper layout of the shops was made, and equipment relocated to provide the best possible working areas and clear aisles, and to minimize work handling. Materials-handling equipment was provided. Obsolete equipment was replaced with new and modern machine tools. New types of tools were added, such as a balancing machine, a multi-duty saw, and a lathe of sufficient size to handle the largest unit to be serviced in the plant. The electric shop was enlarged and properly equipped to handle work done in its field.

Installation of fluorescent lighting, combined with color-conditioning of the shops, not only improved working conditions and boosted morale but also resulted in better quality work. Good housekeeping in the shops followed naturally.

STEP 9. *Add parts-control engineer.* The performance of the maintenance department was further improved by the establishment of a parts-control engineer under the chief plant engineer. All incoming materials or parts, either from the company's shops or outside suppliers, are inspected by him against specifications issued by the engineering department. Any item not satisfying requirements either is rejected or must be modified to make it acceptable. Every item cleared through this channel can be counted ready for use. Prior to this, errors were detected only when an attempt was made to use material on the job, and defects resulted in delays or improper work.

STEP 10. *Set up spare-parts control.* The central storeroom did its part by reviewing its stock of spare parts and stock materials with the maintenance department. Based on needs thereby revealed, proper stock levels were established and new items were added so that delays occurring in purchase or manufacture could be eliminated.



A STAND-BY PROPANE GAS PLANT enabled the Mansfield, Ohio, plant of Westinghouse Electric Corporation to keep operating during a serious shortage of gas last winter. This plant uses about 50,000 cubic feet of gas per hour for heating enameling furnaces, paint line ovens, and other equipment. Shown here is the 30,000-gal. tank in which propane is stored. Another large tank is used to store mixed gas

STAND-BY EQUIPMENT PINCH HITS WHEN SERVICES FAIL

G. A. VAN BRUNT • ASSOCIATE EDITOR, *FACTORY*

SUITABLE stand-by equipment will do a great deal to minimize the effects of failure of such services as gas, lighting, and power. Gas and electric services are highly reliable in most places, but occasional shortages or outages do occur. Such failures pose a serious problem in many plants where stopping of certain equipment or processes almost inevitably results in losses of materials, possibly damage to machines.

Natural or artificial gas, for example, is used so widely by industry to provide heat for furnaces and ovens that even partial failure of the supply is almost certain to have serious effects.

WHEN THE GAS SUPPLY FAILS

Several expedients have been worked out, sometimes in great haste, to meet gas failures. In some instances, gas-fired, low-temperature drying ovens have been provided temporarily with steam coils. Where it was feasible to do so, electric heat also has been used.

In some plants, oil-burning equipment has been installed, particularly on high-temperature equipment.

More commonly, liquefied petroleum gases are used to supplement or replace the regular supply of artificial or natural gas. Use of these liquefied gases, however, is by no means confined to emergencies. They are finding increasing use in many new industrial applications.

The two most important liquefied petroleum gases are known as propane and butane. Both are obtained commercially from natural gas, or from gases produced during the refining of crude oil. While both are gases at ordinary temperatures, they become liquid when subjected to moderate pressure, and can be shipped and handled economically.

The commercial grade of propane boils at −44 degrees Fahrenheit under atmospheric pressure, and develops a pressure of about 124 pounds per square inch gage at 70 degrees Fahrenheit.

On the other hand, normal butane boils at 32 degrees Fahrenheit under atmospheric pressure, and exerts a pressure of about 34 pounds per square inch gage at 70 degrees Fahrenheit.

When changing from the liquid to the gaseous form, both gases expand in a ratio of about 270 to 1. That is, a unit volume of a liquefied petroleum gas will expand to 270 volumes of gas. Heating value is high, running about 2520 B.t.u. per cubic foot for commercial propane and 3260 B.t.u. for commercial butane, as compared with 530-550 B.t.u. for manufactured gas.

Mixtures of propane and butane frequently are used. The proportions of these constituents vary with the different suppliers. The heating value of these mixtures will range around 3000 B.t.u. per cubic foot.

Where an industrial plant's requirements for liquefied petroleum gases are small, delivery in cylinders holding 100 to 150 pounds may be satisfactory. As cylinders become empty, they are returned to a distributing point for refilling.

If the gases are normally used in large quantities, or stored for use in emergencies, they are usually delivered in liquid form by trucks or tank cars and transferred to tanks that are commonly located above ground. Tank cars range from 8000- to 12,000-gal. capacity. Storage tanks range up to a maximum of 30,000-gal. capacity. The popular size is 18,000 gallons. Tanks for transporting or storing liquefied petroleum gases obviously must withstand considerable pressure. Bulk storage tanks, for example, usually are built in accordance with the ASME or API-ASME codes.

Peak demand for liquefied petroleum gases, particularly when they

are used as an emergency supply, comes during the winter. In view of the serious supply and transportation problems at times of peak demands and bad weather, it is usually advisable for a plant to install storage capacity sufficient for, say, a month's full operation, or for the duration of any likely shortage. Also, tanks ought to be filled during the off-peak season.

Liquefied petroleum gases are delivered from storage to the point of use in the form of vapor, which may either be undiluted or mixed with air. Although liquid propane will change to vapor at any temperature above —44 degrees Fahrenheit, some form of vaporizer must be used with butane if the atmospheric temperature drops to 31 degrees Fahrenheit or below. In practice, a vaporizer usually is employed to insure an adequate supply of gas, regardless of the temperature or demand.

Vaporizers are of three general types: (1) Atmospheric, which utilize heat from the ground or surrounding air; (2) the indirect-heated type, which makes use of steam, hot water, or other heated medium; (3) direct, gas-fired type.

A vaporizer unit commonly includes a heat exchanger, pressure regulator, and the various safety devices required for automatic safe operation. The gas may or may not be diluted with air.

In general, liquefied petroleum gases can be burned with the same kind of combustion equipment used for natural or manufactured gas, if the necessary changes are made in the burners and the control devices.

Combustion systems likewise are of three general types: Atmospheric, low pressure, and high pressure. In atmospheric systems, gas pressure ranges from 3 to 12 inches water gage. With a low-pressure system, a mixture of gas and air is fed to the burners at a pressure of several inches of water.

High-pressure systems burn gas at a pressure of 30 pounds per square inch gage, or more.

WHEN THE LIGHTS GO OUT

A serious situation is created when power fails and the lights go out. In the absence of some provision for emergency lighting, workers on night shifts may be injured while trying to find their way around. Even in daylight hours, loss of light may present serious hazards in places where artificial illumination is required. If only the lighting system is affected, as may happen, and machines continue to run, the chances of injury are likely to be increased considerably.

Various methods are used to provide emergency lighting for critical areas. For example, small gasoline or diesel engine-driven generators are used in some plants to provide a few kilowatts for lighting exits, congested or hazardous areas, power plants or boiler rooms, and the like. These small generator units may be arranged to start automatically when the regular power supply fails.

Storage batteries also find considerable use as a power source for emergency lighting. The batteries used for operating oil switches and circuit breakers may be employed to energize emergency lights, particularly in the power plant. Otherwise the batteries are kept solely, or primarily, as a stand-by source that is automatically switched on when power fails. If the battery delivers around 115 volts, the regular incandescent lighting units may be used. Usually a separate emergency circuit is installed, covering only certain machines or critical areas.

When more general illumination is considered desirable, floodlights are installed at certain spots. Floodlights are connected to an emergency circuit that usually is automatically switched on.

Capacity of a storage battery for emergency lighting will vary according to conditions. It is usually considered, however, that capacity for 1½ hours' operation is adequate.

Portable, low-voltage, battery-operated floodlights that can be set up wherever needed also find considerable use.

WHEN THE POWER GOES OFF

In many plants, the processes are such that stoppage of motors through power failure may result in heavy losses. Large amounts of raw materials and intermediate products may be spoiled, and equipment may be damaged. Under these circumstances, provision of an emergency source of power is essential.

Plants that generate all or a large part of their power usually are tied in with the local utility company, from which they can draw power for emergency and/or peak loads. With this arrangement, the chances of a serious power failure are slight.

A different situation prevails with plants that purchase all their power. In such instances the only protection against complete shutdown is a local generating unit of sufficient capacity to operate all machines or equipment that must not be allowed to stop.

These emergency generating units are gasoline or diesel engine-driven and usually range from about 3- to 50-kw. rating. They are commonly arranged for automatic starting upon failure of the regular power supply. Since the power requirements in most plants are beyond the capacity of the emergency generating unit, a transfer switch is used through which the important circuits are kept alive.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 138) . . . a summary of **LABOR DEVELOPMENTS** (page 216) . . . things **YOU WANT TO KNOW** more about (page 204)

TAILORED TESTS TO MATCH MEN AND JOBS

ROBERT E. KLINE • DIRECTOR OF EDUCATION AND TRAINING, NATIONAL CASH REGISTER COMPANY, DAYTON

IT'S "pick the best by test" at NCR. From a modest beginning back in 1944, our personnel testing program has grown until today we are using a battery of 28 tests in different combinations to select and place factory and office workers, field servicemen, and engineers. See outline on following page.

Shop personnel credit the program with giving them excellent guidance. Foremen find that test reports help them select the right man almost to the letter. Training and instruction time is cut. Aptitude tests give information about an applicant that would otherwise take weeks of observation.

One department, convinced by results, has made it a rule not to consider an inexperienced applicant unless he passes the tests with a satisfactory grade. One employee as the result of a test series was able to get out of a 26-year-old rut and into a type of work better suited to his talents.

Tests have been developed for three general classifications of intelligence, four kinds of mechanical ability, two types of mathematical skill, various degrees of manual dexterity, personality traits, job interests, and a wide range of occupational aptitudes. Results are charted and norms drawn. Findings are analyzed and correlated with progress reports of the individual's achievement record.

In developing its program, NCR laid down these rules:

1. Define objectives clearly.

2. Plan testing program and determine job qualifications before selecting tests.

3. Plan testing procedures in advance of giving tests.

4. Provide physical facilities suited to effective testing.

5. Validate tests continually.

6. Coordinate testing with training programs.

7. Provide for flexibility so that changes can be made easily.

Each test is appraised on the basis of how well it can select required skills and how well it can measure the degree of skill possessed by an individual. The initial battery of tests was chosen to detect the primary skills required for the large majority of factory jobs. Later, additional tests were included to meet specific job requirements. In determining a test's length, we were guided by the purpose of the test and the type of job to be filled. Some satisfactory examinations for certain jobs have been held down to ten minutes. Newcomers being tested to uncover their potentialities may be given comprehensive examinations that require several hours.

Considerable emphasis is placed on administration. An industrial relations consultant designed the tests. Personnel were trained to conduct them. Also, a manual was developed that establishes standards for testing procedures, facilities, and equipment.

TESTING ROOMS are quiet, airy, and well-lighted. No distractions or mental hazards here to prevent applicants from concentrating on their work

Failures Eliminated

NCR believes that testing should be tied in with training. For example, we are developing a battery of tests to classify field servicemen. Since these men attend a special school for six months, this education is expensive, and the successful candidate's value to the organization is considerable. By selecting applicants on the basis of minimum specifications for general intelligence, mechanical aptitude, manual dexterity, and personality traits, we hope to eliminate a large percentage of potential cancellations and failures before starting training.

OUTLINE OF PERSONNEL TESTS

TEST	PURPOSE	COMMENTS
PT1 General Intelligence **PT2** General Intelligence (50 Items)	To measure ability to learn, understand instructions, profit by training and experience, and to aid in the selection, placement, reassignment, and development of individual according to general mental capacity	PT1 — suitable for applicants beginning with 6 years of schooling and including college graduates. PT25 is an alternate short test
PT25 Practical Intelligence (70 Items)	To measure the ability to learn and to think quickly and accurately in general plant duties and in machine, mechanical, and bench work	PT25 — especially useful with applicants limited in either education or use of English language. Particularly helpful with applicants for unskilled and semi-skilled work. May also be used for classifying machinists, mechanics, draftsmen, assemblers, and inspectors
PT3 Space Form Thinking	To measure ability to think and visualize in two and three dimensions. An essential test of mechanical aptitude	Suitable for trainees and apprentices. May also be used to classify machinists, mechanics, draftsmen, assemblers of complex equipment, and engineers. Men and women are rated on separate comparative standards
PT4 Mechanical Information (General)	To measure amount of information about tools, equipment, and situations common to persons who have only a general interest in mechanics and machinery	Used with trainees, apprentices, and those who have limited or no experience in machine or mechanical trades
PT5 Mechanical Comprehension (Basic)	To measure ability and understanding of mechanical terms, principles, and information on uses of material, tools, and equipment	A more comprehensive form of PT4. Used with trainees, apprentices, persons with limited or no experience, and for general classification of semi-skilled
PT6 Mechanical Comprehension (Difficult)	To measure ability to understand and apply mechanical principles in fairly complex problems	Used with high school graduates who have had trade school or apprentice training, or whose background shows favorable inclination toward mechanical work. Also applicable in classifying engineers, draftsmen, mechanics, and applicants for complex assembly and inspection work
PT17 Trade Information	To measure information and knowledge of practices in the machine trade for which applicant or employee claims experience	Test is designed to separate "bluffers," limited-experience, semi-skilled, and skilled employees. Suitable for applicants who claim experience in the following machine trades: General machinist, drill press, radial drill press, gear cutting lathe, milling machine, precision grinder, and planer
PT18 Measurement Ability	To measure information and ability in use of precision instruments (such as calipers, gages, and protractors) in machine, mechanical, assembly, and inspection work	Used with trainees, apprentices, semi-skilled, and skilled applicants for machine, mechanical, assembly, and inspection work. Helpful in quickly identifying experienced and skilled workers. Also indicates needs for training
PT7 Arithmetical Computation	To measure ability to perform basic arithmetical operations essential in general plant, machine, and mechanical work	Used widely in classification, upgrading, reassignment of employees, and in determining individual training needs. Particularly useful with trainees, apprentices, and semi-skilled and skilled employees
PT8 Arithmetical Reasoning	To measure ability in understanding fairly difficult arithmetic problems essential for apprentices, skilled trades, and semi-technical, technical, and engineering work	This test is used for applicants who have above average possibilities for mechanical and trade training
PT9 Finger Dexterity	To measure ability in using fingers for work requiring fairly precise movement and good eye-hand coordination	Used with applicants or employees for bench, assembly, or mechanical work, and with apprentices. Men and women rated on separate comparative standards
PT10 Hand-Tool Dexterity	To measure eye-hand coordination and ability in using a tool, such as pliers	Used with applicants for bench, assembly, or mechanical work. Men and women are rated on separate standards
PT20 Two-Hand Dexterity	To measure ability to work quickly and accurately in simple repetitive bench, assembly, machine, and inspection jobs. Involves eye-hand coordination and dexterity of both hands working together	Used with applicants and employees for simple repetitive machine, mechanical, bench, assembly, or inspection jobs, wherein the emphasis is on speed and work with both hands together. Men and women are rated on separate comparative standards
PT23 Metal-Filing Ability	To measure eye-hand coordination and adaptability involving use of tools and metals under standard job instruction conditions with emphasis on accuracy and speed	Used with applicants for bench, difficult burring, assembly, or mechanical work

ABILITY

COPYRIGHT

CONTINUED ON NEXT PAGE

OUTLINE OF PERSONNEL TESTS... continued

V. PERSONALITY TRAITS

VI. INTERESTS

VII. OFFICE-WORK ABILITIES

VIII. TECHNICAL ABILITIES

IX. MACHINE-OPERATING ABILITIES

X. SUPERVISORY ABILITY

TEST	PURPOSE	COMMENTS
PT11 Stability, Aggressiveness, Sociability **PT11.2** Sociable, Optimistic, Stable, Carefree, Active **PT11.3** Energetic, Aggressive, Self-reliant, Confident, Calm **PT11.4** Cooperative, Objective, Agreeable	To measure personality traits which cannot be appraised reliably by ordinary observation and contact with people	Requires cautious use and interpretation. Ratings are definitely influenced by the cooperation, interest, and willingness to answer questions frankly. May be particularly helpful with applicants who would benefit by vocational guidance. Special use may be found in positions requiring varied contacts with people or supervision. For some types of work a low rating on one or several personality traits may be desirable, while for other types of work an average or better rating is preferred
PT12 Special Interests	To measure special interests by obtaining an index of familiarity with words in broad activities, such as human relations, commerce, science and mathematics, government, fine arts, and sports; and which may be related to job classifications and positions in the company	Has particular value in classification, reassignment, and upgrading of employees, applicants, and apprentices who would benefit by vocational guidance. Its usefulness further established for determining the trend of interests for office, technical, skilled trades, and supervisory or other positions requiring varied contact with people
PT13 Occupational Interests (Men)	To measure more specific occupational interests by obtaining an index of likes, indifferences, and dislikes for things, people, and activities which have been found to be significant for success of men in such fields as engineering, law, teaching, chemistry, production, management, accounting, sales, advertising, purchasing, and office work	Has special value in classification, reassignment, and upgrading of male employees, applicants, and apprentices who would benefit by vocational guidance. The fairly complicated rating procedure may be gradually simplified by comparisons with job classifications and broad occupational groups involving activities with technical, sales, science, commercial, language, people, etc. The significance of ratings is determined considerably by the cooperation of the individual in answering the questions frankly
PT14 Occupational Interests (Women)	To measure more specific occupational interests by obtaining an index of likes, indifferences, and dislikes for things, people, and activities which have been found to be significant for success of women in such fields as law, teaching, office work, secretarial work, nursing, sales, and librarian	This test will have special value with women applicants and employees who would benefit by vocational guidance. Comments on rating procedure for interests of men (PT13) are also appropriate for women
PT15 Office-Work Abilities	To measure abilities essential for secretarial, general office, and clerical work, such as word meaning, spelling, arithmetical computation, arithmetical reasoning, checking, and posting	Has broad usefulness in selection, reassignment, and upgrading. It also has special value in determining training needs of applicants and employees
PT19 Typewriting Ability: Practice Copy, Letter Copy, Corrected Copy, Continuous Straight Copy	To measure abilities to type quickly and accurately; to work continuously with adequate concentration; and to operate typewriting machine with dexterity	Measures basic skill and aptitude for work as typist. Used with recent high school graduates who have completed typing courses. Also suitable for classifying applicants or employees for routine and more difficult work in typing. Ratings on this test provide a measure of speed or *number words typed per minute, accuracy, and ability to do a good typing job continuously*
PT16 Technical Intelligence	To measure a combination of abilities required for complex thinking and judgment in technical or laboratory responsibility that involves the physical, chemical, and engineering sciences. The test is suitable as an aid in selection, placement, reassignment, and training for technical, research, engineering, and laboratory personnel, with educational levels ranging from some college and including Ph.D. degrees	A high average or better rating on general intelligence (PT1 or PT2) is a prerequisite for this test. The rating on the technical intelligence test appears negligibly influenced by special information. It may be used with applicants and employees who have had some technical and scientific training
PT21 Simple Machine Coordination	To measure ability to coordinate eyes and hands quickly and accurately in simple, repetitive, or automatic machine operations	Useful in selecting learners and experienced workers (men and women) who may be assigned to simple machine operations
PT22 Complex Machine Coordination	To measure ability to work with fairly complex machines, and to coordinate both hands and eyes quickly and accurately	Useful in selecting and upgrading experienced workers and learners for semi-skilled and fairly complex machine operation
PT24 Job Relations Information	To measure understanding of fundamental principles affecting relations with people that are important in daily supervision of employees	Has broad usefulness with all levels of supervision. Especially helpful in up-grading, determining training needs, and planning a personal development program for supervisory personnel

COPYRIGHT

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Look for AFL and CIO political activity to hit record level next year. And for strikes to fall to lowest ebb.

Both prospects stem from Taft-Hartley law. Labor convention promised the political fireworks. Strike statistics, steel contract, and politics foretell labor peace.

Out-do CIO's Political Action Committee. *That's target of "Labor's Educational and Political League," AFL's new political arm. To do this, AFL aims at $5 million fund raised by* per capita *tax boost for 7,600,000 members, 26¢ assessment per member, contributions from affiliated unions.*

CIO relies on dollar donations by 6,000,000 members while organizing political machine down to precinct and block levels. Could raise $2 million kitty.

Hopes of both AFL and CIO: *Elect to Congress persons who will vote to kill Taft-Hartley law. Political lines will be crossed. CIO, with help of some railroad brotherhoods, will back Truman. AFL will stick to senatorial and congressional endorsements only.*

Third party next year? Not a chance.

Do these activities violate Taft-Hartley ban on political expenditures by corporations or labor unions alike? Taft says they do if funds are raised by assessments or come from union dues. Meanwhile, Justice Department probes into PAC by-election antics.

Strike downtrend already is in evidence. *Number of strikes has dropped steadily since new law passed in June. For example, 101,000 workers were involved in 221 strikes during the first week of new law. By mid-October, only 32,000 were idle in 104 strikes.*

Political situation and operation of Taft-Hartley curbs make strike outlook favorable for next year. Also, steelworkers can't strike for wage increase. This time, auto or electrical workers will spearhead any wage drive. It might be Walter Reuther and General Motors again. Sixty-day notice can be filed January 19.

•

Right now, there's little sentiment in labor ranks for another spin of the wage-price spiral. Significantly, labor conventions aimed their fire at prices and profits. Many leaders feel wage peak is here. For a while, at least. They will plump for price reductions. This failing, they will claim justification for new wage demands.

If prices can be held until spring, wage demands will soften. In that event, unions will accept alternative concessions. Note the groundwork Reuther lays for pension demand on General Motors. From him GM got nine "minimum standards" union will insist on. In steel, U.S. Steel and CIO are molding a benefit plan "involving life, accident, health, medical, and hospital insurance."

Meany and Tobin emerge as strong men of AFL after facing up to Lewis at San Francisco. Lewis took a beating, quit the executive council. Hutcheson, siding with Lewis, lost prestige.

What does it all mean? Will Lewis quit the AFL a second time? We think not. Lewis wants the political power the AFL can give him — power within organized labor and in national politics. Furthermore, he wants to succeed William Green as AFL chieftain.

Lewis's plight over District 50 points up one issue keeping CIO out of AFL. When Lewis went back, District 50's status was left for future determination. Now Lewis refuses to carve up District 50. CIO wants assurance of "life, liberty, and happiness" for its unions *before* reaffiliation. AFL won't promise.

•

Quietly, Philip Murray stimulates opposition against Communist elements in CIO. Once a strong supporter of UAW-CIO's R. J. Thomas, Murray has dropped him like a hot poker. Instead, Murray now embraces Walter Reuther, most outspoken CIO antagonist of Communists. Reuther not only will keep his UAW presidency, but threatens to carry a majority of the executive board with him. It's a left-wing rout.

NLRB's rule honoring non-Communist affidavits of single unions puts the heat on Communist-led outfits. Now almost all unions will rush to qualify. Or endanger their status.

In six weeks, 8208 union officers filed non-Communist oaths with NLRB. From AFL, 4784. From CIO, 184. From independents, 3240.

Individuals make more use of the Taft-Hartley law than either management or unions. *Of 335 unfair labor practice charges against employers, 305 were brought by individual workers.*

In contrast, management filed only 42 charges against unions during the same period. Thirty other complaints against unions came from independent unions.

STRAW IN WIND. Contract with West Coast shipowners gets around closed-shop ban. Sailors will be hired on seniority basis. This assures jobs to union men.

ANOTHER STRAW? Election Day is now a holiday with pay for employees of a New York company represented by the Machinists Union.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Watch the winter wheat crop reports if you want to know what your grocery bills will be next year. To keep up with foreign and domestic demand—and to keep prices from soaring sky-high – we need another bumper wheat crop in 1948.

So far, however, rainfall has been less than a quarter of normal in the winter wheat belt. If it doesn't rain hard soon, there won't be enough moisture in the soil to carry wheat through the winter.

If the per-acre yield fell just to the average of the last 10 years, we should be 100 million bushels short. That would really send food prices shooting up.

Higher food prices would send the inflationary spiral through another whirl in 1948. And it's hard to see how the economy could take another dose of inflation without keeling over into a business slump.

High prices – particularly the high cost of eating – are the only big threat on the business front. Almost all the other indicators point in the right direction.

Dollar value of the nation's total output of goods and services is now running at the record rate of $230 billion a year. *However, most of the $10 billion increase since the turn of the year represents higher prices, not more production.*

Industrial production has picked up most of the ground lost earlier in the year. The Federal Reserve index moved up from 178 in July (1935-1939 = 100) to 182 in August. And September may be a few points higher.

Non-agricultural employment reached a record 43 million in mid-September. That's 450,000 above August. Manufacturing rang up an advance of 150,000.

Wages are at record levels, too. Average weekly earnings in manufacturing topped $50 for the first time in September. *Thus they are more than double the 1939 figure ($23.86). But, if you adjust for higher living costs, the average worker can buy only 30 per cent more now.*

•

Department store sales picked up smartly in September, racking up a 16 per cent advance over a year ago in the week ending September 27. But by mid-October dollar sales were running only a little ahead of last year. Because prices are higher, that means volume is down. Even so, it is huge by any pre-war standards.

The upswing in homebuilding that got under way in July is still going strong. As many new houses were started this September as in September, 1925, the biggest homebuilding year ever. New houses are still priced beyond the pocketbook of the average worker, however. So the housing boom won't last much more than another year unless costs can be hammered down.

High building costs explain why construction hasn't expanded as much as other businesses. Before the war construction accounted for 10 per cent of national income on the average. This year it will be closer to 6 per cent.

There's more than enough work that needs to be done to boost construction activity to its pre-war position. But costs are so high that all but the most urgent projects are being shelved.

In one sense that's a good sign. If costs can be cut next year to levels that look reasonable, increased construction activity can be counted on to take up any slack in over-all business.

But, if costs can't be hammered down, a small dip in over-all business might send construction into a major tailspin. Everyone would chop his construction budget fast in the hope that the dip would lower building costs.

•

Industry's plant and equipment expenditures are outrunning estimates made last spring. In March a joint Commerce Department-SEC survey showed that business planned to spend $6.9 billion on capital items in the last half of the year. Latest survey puts the total at more than $8 billion, a good 16 per cent up.

Thus business spending on new plant and equipment has flattened out at a rate of $4 billion a quarter. On an annual basis, that's a third higher than last year, almost double 1941, and two-thirds above 1929.

As long as business spending stays that high, heavy goods industries will boom. And every businessman knows you can't have a real business slump without a letdown in heavy goods.

What's more, there's no sign of a letdown in business spending any time soon. Some of our biggest industrial giants are just getting into full stride on their post-war expansion programs. And the big rise in unit labor costs provides the most powerful incentive possible for every business to invest in cost-saving equipment.

Nevertheless, a decline in business spending for new plant and equipment may well be the first signal of a business slump. It could happen this way: *Businessmen might decide that prices are about to collapse of their own weight.* So *they would postpone their spending. This would hit heavy goods production hard.* And *a real economic tailspin would be set in motion.* However, there are as yet no clear signs that this will happen in 1948.

LUMBER FROM BOXCARS IS STACKED IN BUNDLES. HIGH-LIFT TRUCKS MAKE EASY WORK OF MOVING BUNDLES TO STORAGE AREA

FORK TRUCKS DOUBLE STORAGE CAPACITY, HALVE MAN-HOURS

FRANK M. BRANDON • VICE-PRESIDENT IN CHARGE OF MANUFACTURING
CONSIDER H. WILLETT, INC., LOUISVILLE

Two specially constructed high-lift fork trucks have doubled the lumber storage capacity at our plant. And the labor force required to handle this increased volume has been cut almost in half.

Eight to 16-ft. lengths of lumber are unloaded from boxcars and immediately stacked into bundles 4 feet high, 6 feet wide, and varying from 8 to 16 feet in length. The trucks, which have a capacity of 1200 board-feet, make an easy job of stacking these bundles 5 high. That means a total available vertical storage space of 21 feet 8 inches, including the 4x4-in. spacers between bundles. With the old, manual method of stacking, 10 feet—less than half the present height—was the practical maximum.

After the lumber has air-dried, another quick truck-move places the bundles in the kilns. Result: Two time-consuming hand operations eliminated. No longer need bundles be broken down for transport to the kilns. And lumber need not be re-stacked at the kilns.

Many Man-Hours Saved

Before the trucks arrived, it required 20 to 22 men, 80 dollies, and a yard tractor to handle 500,000 board-feet of lumber a month. By eliminating 3 of the 4 stacking operations, 10 to 12 men, including the 2 truck operators, can do all of the yard handling, which runs close to 1,000,000 board-feet a month.

Not to be overlooked is the fact that the trucks made it unnecessary to purchase high-priced land for additional storage space. Doubling the vertical storage height "enlarged" the present 1½-acre lot to the point where it is sufficient for all present needs.

TRUCKS stack bundles five high—21 feet, 8 inches. Ten feet was the practical limit when lumber was piled manually

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

SALVAGED ABRASIVE WHEELS SPEED MAINTENANCE WORK

H. J. KEENER, Plant Engineer, Conmar Products Corporation, Newark, N. J.

Worn abrasive wheels from a cut-off saw in Conmar's steel stockroom are no longer discarded, but put to good use in its maintenance department.

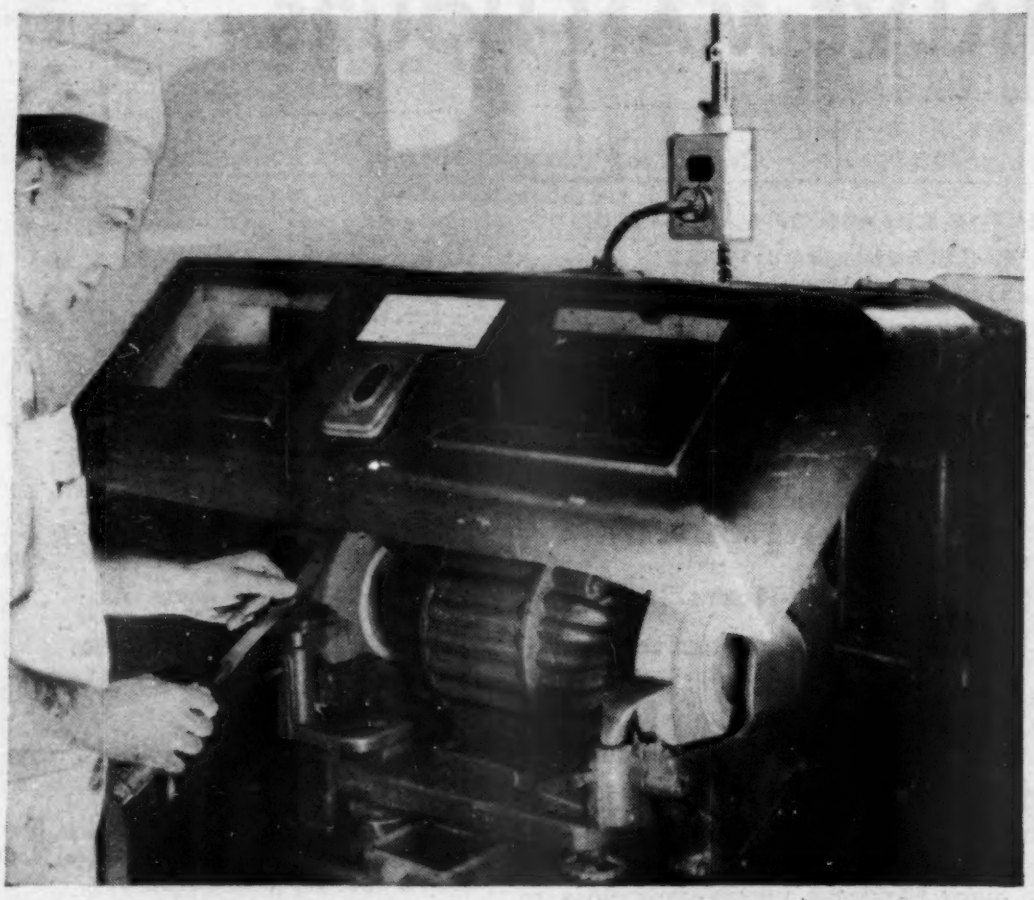
Over a period of time about 300 worn wheels, originally 16-in. diameter, had accumulated because they could not be used below a 10-in. diameter in the stockroom machine. In an effort to utilize these wheels, the company installed a smaller abrasive cut-off saw in the maintenance department. Here the wheels can be used down to 5½ inches. The wasted grinding circumference is thus reduced from a former 62 per cent to 34 per cent. This saving alone has justified the investment in the new saw.

Another saving was made in that the large power saws were relieved of all small utility jobs. The cut-off saw is now used for cutting all materials up to 4 inches in outer dimensions. These include iron rods and bars; angle iron; galvanized, brass, and iron pipe; steel plate; drill rod; cold rolled and stainless steel.

The cut-off saw will cut across a 2-in. galvanized pipe in 10 seconds as compared with 80 seconds formerly needed on the big saw. Angle iron, 3/16x2x2 inches, is now cut in 6 seconds as against 90 seconds formerly. The cuts are clean, and maintenance cost of the machine has proved low.

●

Tickets to "live" broadcasts are obtained for their employees by the Century Electric Company, St. Louis. The several hundred tickets distributed during the past year have provided relaxation and entertainment for the workers, and the company feels that they help to broaden the worker's background, improve his social life



INSTEAD OF HAVING SHIELDS over each wheel of a two-stone grinding wheel at the Boston Gear Works, Quincy, Mass., a shield completely covering both is used. With the old system of individual shields, it was possible for a piece of emery to fly out at the side and injure a worker standing at the next wheel. With the new design, this is now impossible. Relocated lights give glareless illumination, and are wired so that both motor and lights are controlled by the same pushbutton

PORTABLE UNIT BRINGS SAFETY FILMS TO THE SHOP

ALVIN PITTMAN, Safety Director, Standard Register Company, Dayton, Ohio

Safety films are now brought directly to the worker in his shop here at Standard Register. We have always tried to keep our employees "safety minded," but found that if the films were shown in the auditorium, it meant

This portable rear projection unit brings safety films directly to the workers in the shop. The cabinet, 6 feet high by 7 feet long, is easily moved from one department to another. It shows both 35-mm. and 16-mm. sound or silent movies on a 30x24-in. screen

either closing down a whole department while the workers were seeing the films, or paying overtime while they stayed after hours to see them.

So we developed a mobile unit that can be plugged into any 110-volt circuit, and that shows both 35-mm. and 16-mm. sound or silent movies. Any standard type of projector can be used. The picture is projected on a mirror in the back of the cabinet, and reflects on the 30x24-in. screen in front. A microphone attachment allows the foreman to speak to the group, tying in the subject of the film with any special safety problems involved in his particular department.

The machine makes the rounds of the plant every two months. Where there are more films of special interest to special groups, such as in the machine shop, showings are more frequent.

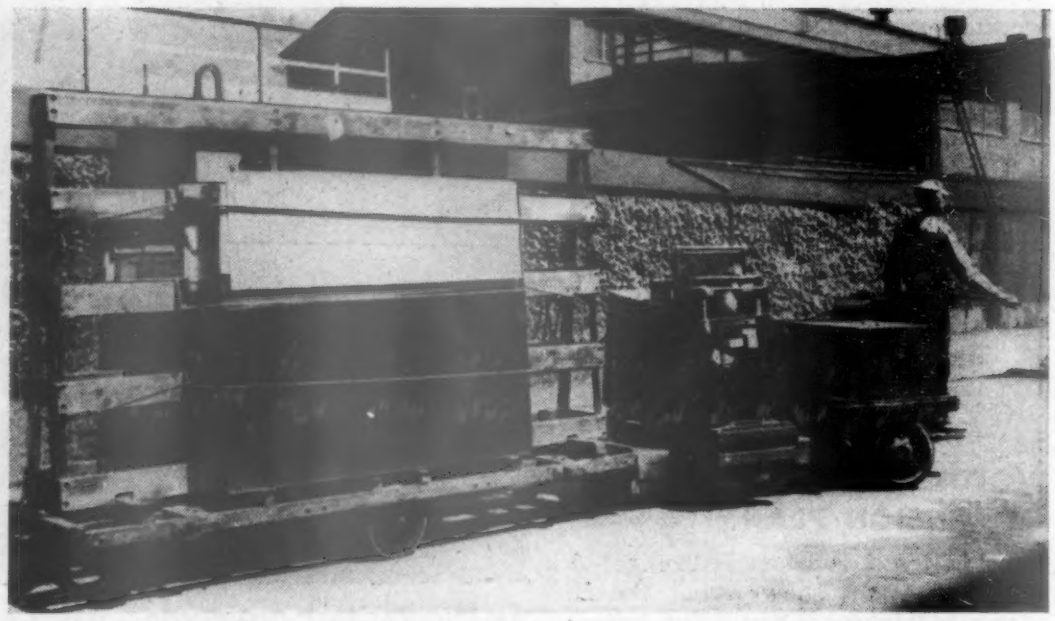
Schedules are worked out with division foremen. At the appointed time, the projector arrives, is plugged in, and the men gather around in groups

of 25 or 30—larger groups are found to be impractical. Lights do not have to be lowered, and the picture is plainly visible and the sound track audible to anyone within 200 feet. Work goes on as usual beyond this area.

Only one film, about 15 minutes long, is shown at a time. These are provided without charge by the National Safety Council, insurance companies, and other sources. They deal with materials handling, good housekeeping, eye care, use and care of hand tools, and other safety topics.

The program of safety education, in which these films play an important part, resulted in a 6-month no-accident record—a total of 1,700,000 manhours without a single accident.

●



SPECIALLY DESIGNED SKIDS and battery-powered trucks handle sheet glass being moved to and from storage areas and the various departments at Pittsburgh Plate Glass Company, Creighton, Pa. These are built with an A-frame in the center, against both sides of which the glass is propped on edge, supported by pads. Two fixed wheels in the center and two casters on each end allow easy maneuverability

FIVE-FOOT CIRCLES, red and white, show employees location of fire boxes at the Jefferson, Indiana, plant of the Colgate-Palmolive-Peet Company. A light above each flashes on automatically when box is pulled, indicating where alarm is turned in

●

INCREASING EFFICIENCY OF HEAT EXCHANGERS

G. L. RADAMAKER, Consulting Engineer, Detroit

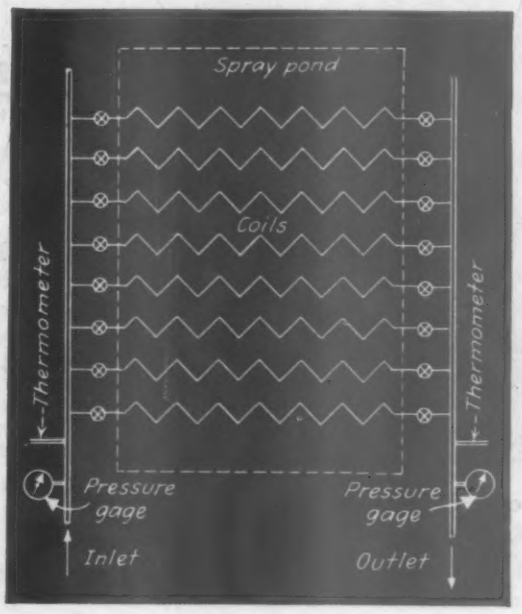
Any plan that will reduce maintenance 25 per cent is welcomed by management. Through a simple change in the operation of the heat exchanger used for cooling quenching oil we found that we could accomplish just this.

The cooling medium used is water. It is sprayed directly over a bank of 64 coils, 1¼ inches in diameter, and about 50 feet long. Originally, this heat exchanger had no pressure gages or thermometers. These were installed as shown in the diagram as part of a study to determine pressure and temperature drop across the heat exchanger while in operation.

We had been operating with all coils cut in. This resulted in a pressure drop across the coils of about 3 pounds. It was believed that if we could increase the velocity of the oil passing through the coils, thereby increasing its "scrubbing" effect, we could operate for longer periods between cleanings. This we found to be true.

Further, it was found that the desired quenching oil temperature could be maintained with less than one-half the bank when the coils were clean, with a pressure drop of 4 pounds. Also, with the greater velocity, the coils maintained the desired temperature about two and a half times as long as when using all coils.

We now use only half the bank of coils, and disconnect the other fouled half and steam them clean. In this way, there is no lost time, and maintenance costs are reduced about one fourth.



"SAFETY INSPECTOR" HONORARY APPOINTMENT

One worker in each section at the Philip Carey Manufacturing Company, Kansas City, is appointed "Safety Inspector" for the week. He wears a badge, and reminds his co-workers of safety rules and regulations.

It is an honor to be thus chosen, and, as inspector, the worker does everything he can to eliminate hazardous conditions. It is his responsibility to maintain a good safety record. And he realizes that it is in reality to his own benefit to do so, as any accident slows up production, and thus reacts to everyone's disadvantage.

●

WINDOWS PAINTED INSIDE AND OUT FOR COOLNESS

L. W. DEAVER, Vice-President, Cherokee Textile Mills, Knoxville, Tenn.

All window and skylight areas in this cotton-weaving plant have been painted inside and out with aluminum paint. Originally tried out in one department in order to eliminate sun glare and heat, this procedure proved so satisfactory that it has since been carried out throughout the entire plant.

The employees in the first area in which the experiment was made found that keeping the windows closed after they had been painted resulted in cooler quarters, so the other departments requested that their windows be treated the same way.

A plant-wide fluorescent lighting system had previously been installed which furnishes about 30 foot candles at working level. Painting the windows has now resulted in uniform

working conditions in all three shifts, regardless of outside weather conditions. And since it now resembles in many respects a windowless plant, an inexpensive emergency lighting system has been installed which starts up automatically when there is a power failure.

Another good feature of this plan is that the paint is applied to the metal frames as well as to the glass, thereby giving protection against corrosion.

●

PICTURES SHOW BENEFITS OF PENSION PLAN

What will you do when you retire? A 20-page booklet shows what the 19 former employees of The Rohm & Haas Company, Philadelphia, are now doing as they enjoy the benefits of the company's pension plan. Not just photographs of these folks, but action shots showing them engaged in their favorite pursuits, many of which are profitable as well.

When the plan was started, it was found that there was skepticism on the part of some employees as to its workability. Particularly the foreign-born, who did not always understand the meaning of old-age security, were hard to reach.

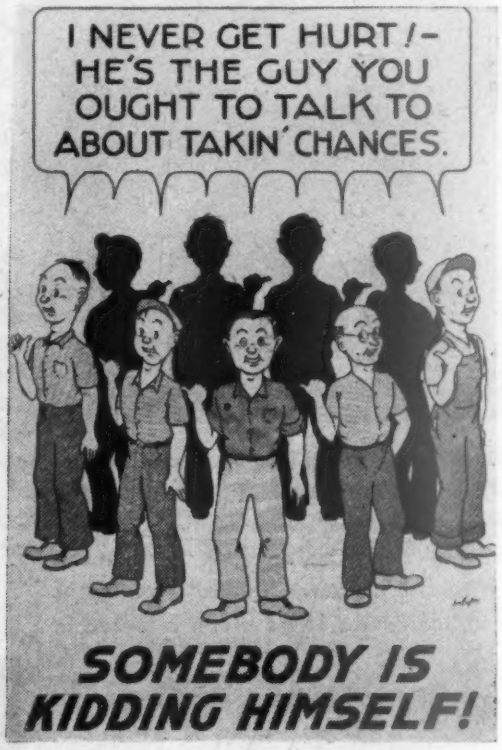
Now, however, the plan has been in existence for three years. During this time, 19 have become eligible for its benefits, and real-life photographs of all 19 are included in this booklet.

To bring home "the facts behind the photos," the last page lists "Typical Benefits," showing monthly pensions based on a scale of yearly earnings. The lump sums received by dependents in case of death before retirement are also shown.

AN ENDLESS BELT CONVEYOR in the cafeteria at Galvin Manufacturing Corporation, Chicago, saves time for the employees, and has cut the clean-up crew from 15 to 2. Employees leave their plates on the trays while they eat. When they have finished, they carry their trays, with the empty dishes, to the side of the cafeteria, and place them on the conveyor which takes them into the kitchen. Service has been speeded up 25 per cent, because it is no longer necessary to wait while someone cleans the tables

SPECIAL "CONSUMER-EYE" INSPECTORS are assigned to the assembly lines in the Willow Run plant of Kaiser-Frazer Corporation. These men double-check every car as to the condition of upholstery, proper fitting of doors and trim, perfect paint finishing, and other factors important to the sale of the final product

This cartoon was developed by the Ohio Industrial Commission to illustrate the passing-the-buck attitude most plant men have about applying safety training to themselves



●

LUNCH-HOUR MOVIES PROVIDE RELAXATION

"Relax on your lunch hour." That's what the Century Electric Company, St. Louis, tells its employees.

Twice a week they show movies in the company's assembly hall — short comedies, travelogues, musicals, and miscellaneous educational films. The films are obtained without cost from railroads, industrial concerns, and through magazine announcements.

The movie equipment belongs to the company. It is available for special meetings of employees on request.

maintenance data sheet 146

SAFETY RULES FOR MAINTENANCE MEN

Source, Mathieson Alkali Works, Inc., Saltville, Va.

TOOLS

1. Inspect tools daily for broken or weak handles, burrs on hammers, chisels, etc. Do not use if burred or faulty.

2. Sharp-edged tools such as hoes, axes, scythes (a) should be carried point down with both hands, not over the shoulder; (b) should be set down carefully — not allowed to drop with the cutting edge up.

3. When using a wrench or similar tool, guard against a bad fall in case the tool should slip.

4. Use guards as provided.

5. Use the right tool on each job. It's safer, faster, and cheaper.

MOVING MACHINERY

1. Pull the safety switch before working on equipment. Hang a "Men Working" sign on the switch. Also, it is recommended that the switch be locked open with a padlock, or that all fuses be removed from the switch.

2. Wear tight-fitting clothing. Short or rolled sleeves are preferable.

3. Never start a machine without seeing that no one else is working on it.

4. Keep guards in place. No job is complete without replacing all guards properly.

5. Don't talk to machine operators.

6. Keep your hands in the clear of moving fans, fan belts, transmission chains, chain blocks.

7. Know how to run a machine before you try. Wait until you get instructions.

8. Avoid replacing a belt on fast-moving pulleys. If power is necessary, use slowest speed possible; have an experienced man replace belt, and another experienced man on starting switch.

LADDERS

1. Use only factory or shop-made ladders.

2. Scrap ladders when they begin to weaken.

3. Ladders must not be used in a nearly vertical position nor in a horizontal position. They will tip or break if so used.

4. Straight ladders should be held in place or secured by tying or blocking the foot.

5. When climbing ladders face the ladder and have the free use of both hands.

6. Never splice two ladders. Use an extension.

7. If ladders must be placed in front of a door, have the door watched, locked, or propped securely shut.

EXTENSION CORDS AND ELECTRICAL EQUIPMENT

1. Keep cord in good state of repair. Do not use with exposed wire.

2. Always use a guard over the bulb.

3. Never use an ordinary cord in wet tanks or vessels. Use a tested, waterproof cord, or non-hazardous devices such as candles or flashlights.

4. Do not make electrical repairs, except for renewing fuses or lights. Have an electrician do the work. Beware of power wires or feeders. Assume that all wires and switches are hot until proved dead.

5. Do not stop (or start) electrical equipment by throwing the safety switch. When throwing safety switches, always use the left hand and turn the face away from the switch.

SCAFFOLDS

1. Be sure scaffolds are plenty strong. Test them.

2. High scaffolds must have adequate rails.

3. Scaffold floor planks must not extend out over the supports unless adequately nailed in place.

4. Ladders must never be used as scaffolds.

5. In tearing down scaffolds, all nails must be either removed or bent over. Pile lumber up carefully.

6. Keep scaffolds clear of loose tools, timbers, and other objects which in falling might injure someone below.

CLEANING PIPES AND EQUIPMENT

In cleaning or repairing equipment and pipelines:

1. Be sure they are drained and washed out.

2. Tell the operators what you are doing.

3. Watch out for liquor that remains in inaccessible places or behind blockage.

4. When cleaning tubes in which there has been caustic, be careful when inserting drill to avoid spurting caustic.

CONTINUED ON NEXT PAGE

maintenance data sheet 147

SAFETY RULES FOR MAINTENANCE MEN

CONTINUED FROM PAGE 133

HIGH-PRESSURE EQUIPMENT

1. Make certain pressures are released before starting to work on high-pressure equipment.

2. Cylinder valves must not be removed unless all pressure is first released.

PAINTING

1. Keep all paints and thinners off the skin as much as possible.

2. Wash your hands and face thoroughly with hot water and soap before eating and at quitting time.

3. Always change your clothes at the end of the day.

4. Never eat or bring food within 25 feet of painting work.

5. Spray-gun operators must never point the gun at any person.

6. Hoods supplied with fresh air must be worn when using paints having a poisonous solvent.

7. Supply adequate ventilation when painting in enclosed places such as tank cars and tanks.

8. Know the properties of the paint being used at all times, and be especially careful with paints containing flammable or poisonous solvents.

9. Use only non-sparking tools and approved vaporproof extension lights around flammable paints.

10. If painting seems to be injuring your health, have the doctor give you a physical check-up and change your work if necessary.

ELECTRICAL WORK

1. When handling "hot" wires or working around exposed "hot" lines, employees must use tested rubber gloves, rubber blankets, hose, and other safeguards. Leather covers must be worn over rubber gloves.

CLEARING LINES

1. Open the circuit breaker before opening the disconnecting switches.

2. The *all clear* signal must be given by the same person who cleared the line and must be given to the same operator (or his relief). The person giving the *all clear* signal is responsible for first seeing that all men are off the line.

GROUNDING LINES

1. Men working over dead high-tension lines must first ground these lines.

2. All lines are to be considered "hot" until proved otherwise, or grounded.

POLE WORK

1. Use safety belt.

2. Check the condition of pole and crossarms for rotting.

3. Brace weak or rotten poles with guy wires or manned spike poles. Be sure guys clear all moving vehicles.

4. Handling live wires on a pole should be done by two men.

5. Tools and small equipment for use on a pole must be raised and lowered with a hand line and canvas bucket, and not be thrown or dropped.

6. In renewing poles: (a) Work on the new pole when possible; (b) lash the pole tops together, if possible, at a point not more than 6 feet from the top.

GENERAL

1. Pipes, ladders, or other long articles, when being handled near live wires, should always be carried by two men so that each end is under close control and observation.

MISCELLANEOUS

1. Acetylene torches are to be used only by properly instructed men.

2. Keep your hands, fingers, feet, clear of joints or connections where they may be mashed.

3. Never work on a crane runway unless there is a good crane stop between you and the crane; if working with or near arc welding operations, always wear proper colored goggles.

4. Never put wet metal or tools into a pot of molten metal. If you do, it will explode.

5. Never pour molten material into a hole in concrete which contains water or is wet.

6. Always warn a welder of dangers such as a load passing over him. Remember his vision is limited by his faceshield.

7. Two men should carry large or bulky materials. Two men carrying long articles should always carry them on the same shoulder and should watch the ends.

8. Before knocking out drift pins or bolts be sure that they won't fly and strike someone.

9. When backing out rivets or knocking off heads, use a shield to keep rivets from flying. Never stand in front of a rivet buster.

10. Avoid using bolts or nuts with battered heads, or wrenches with misshaped jaws.

11. Keep all hammers and other striking tools fitted with good smooth handles, free of splinters

CONTINUED ON PAGE 136

CLARK CLAMP LIFT TRUCK

DEPENDABLE

POWER

EXIDE-IRONCLAD POWER
AND BATTERY ELECTRIC TRUCKS

The efficient, cost-cutting team that speeds materials handling

You gain all along the line when your materials are handled by electric trucks and Exide-Ironclad Battery Power. This modern efficiency team keeps goods moving in greater volume, and saves time and money all day long.

Exide-Ironclad Batteries are preferred for electric truck service because of their great power and dependability . . . a result of special Exide-Ironclad construction, which is unlike that of any other battery.

One important Exide-Ironclad feature is the positive plate which consists of slotted tubes containing the active material. So tiny are these slots that, while permitting easy access of the electrolyte, they prevent the active material from readily washing away. The results are high power ability, longer life, greater economy and safety.

Write us for a FREE copy of Exide-Ironclad Topics which contains "Case Studies" of material handling problems. It tells how to cut handling costs up to 50% . . . covers latest developments in handling materials from receiving to shipping.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

CLARK CLAMP LIFT TRUCK

maintenance data sheet 148

SAFETY RULES FOR MAINTENANCE MEN

CONTINUED FROM PAGE 134

and cracks, and well wedged into head of tools.

12. Do not use chisels, cold cutters, drift pins, hammers, or other striking tools with mushroomed heads. Have them reconditioned or replaced.

AIR-OPERATED TOOLS

1. Before disconnecting a hose from an air machine, be sure the air is cut off and hose pressure relieved.

2. When attaching or detaching an air tool from the hose, do not hold the hose and twirl the tool. This is unsafe. Preferably use regulation air line fittings. They are safer and faster.

3. Do not pass air tools to another workman by using the hose for a line. Pass from hand to hand or use a handline.

4. Do not point an air hammer toward anyone. Remove snap and plunger when leaving the job for any reason.

5. Do not allow trucks to run over air hose. Lay it between two planks to protect it.

6. Never use an air impact wrench without first making sure that the socket is properly attached.

7. Do not guide a power-driven bit into place by taking hold of the bit with your hands.

8. When using air machines, stand so that you will not be caught if the machine fouls.

RIGGING AND HOISTING

1. Never use wire rope in a block made for manila line.

2. Sheaves and blocks for wire rope must be used only for the diameter of wire rope for which they are grooved.

3. Always see that a turnbuckle cannot unscrew when put under load.

4. In removing wire rope from a reel, mount the reel securely so that it can turn freely.

5. All employees are forbidden to ride on any load being handled by a derrick, crane or hoist.

6. Make certain that loads are well balanced and securely fastened before making a lift.

7. Stay clear of moving loads and keep others in the clear. Do not walk, or allow others to walk, under a swinging load.

8. Pile material safely. Use ample blocking and do not exceed a safe height of pile.

9. Ropes, cables, blocks, and clamps must be inspected frequently. Do not overload or damage them, or use when defective.

10. Always use a properly fitted handle on jacks; never use a crowbar. Latch and remove handles from loaded jacks.

11. Never let the end of a running cable come so close to a sheave or stop that the cable clamps are jammed together. Should this occur, replace the clamps properly at once.

12. Be sure cable spreaders or other hooks are in place before hoisting a load.

13. Do not take hold of cable near the sheave block; your fingers may be drawn into block.

14. Make sure that all guy lines are properly and securely placed.

15. Hoisting engines must be adequately tied down, staked, or otherwise anchored.

16. Before a load is hoisted, see that it is free of material that may loosen and fall out in case the load is bumped.

17. Always be sure guys are clear of any moving vehicles.

18. Never tie a guy to a railroad track in such a way that a train or truck can cut it off. Flag the track if a guy must be put across it.

19. Sliding down manila lines, wire ropes, guys, or falls is expressly prohibited.

20. Hoist or crane operators must recognize signals only from the signalman assigned. Signals should be standard.

21. When raising or lowering heavy loads, move them slowly; apply brakes carefully; and keep the load under safe control.

22. When handling heavy loads, be sure the clutch and brake frictions are tight enough before moving the load.

23. Hoist or crane operators should beware of electric wires, guy lines, or structures, and avoid striking them with the boom or cables.

24. Before moving a crane with an empty sling, both ends of the sling should be hooked to the blocks or hooked high enough to clear all obstructions.

25. Spot the upper block of hoist directly over the load when possible; when not, raise slowly to avoid the dangers of a swinging load.

26. Where necessary, signalmen should walk ahead of a moving load to keep workmen in the clear and to make sure that the load clears all obstructions.

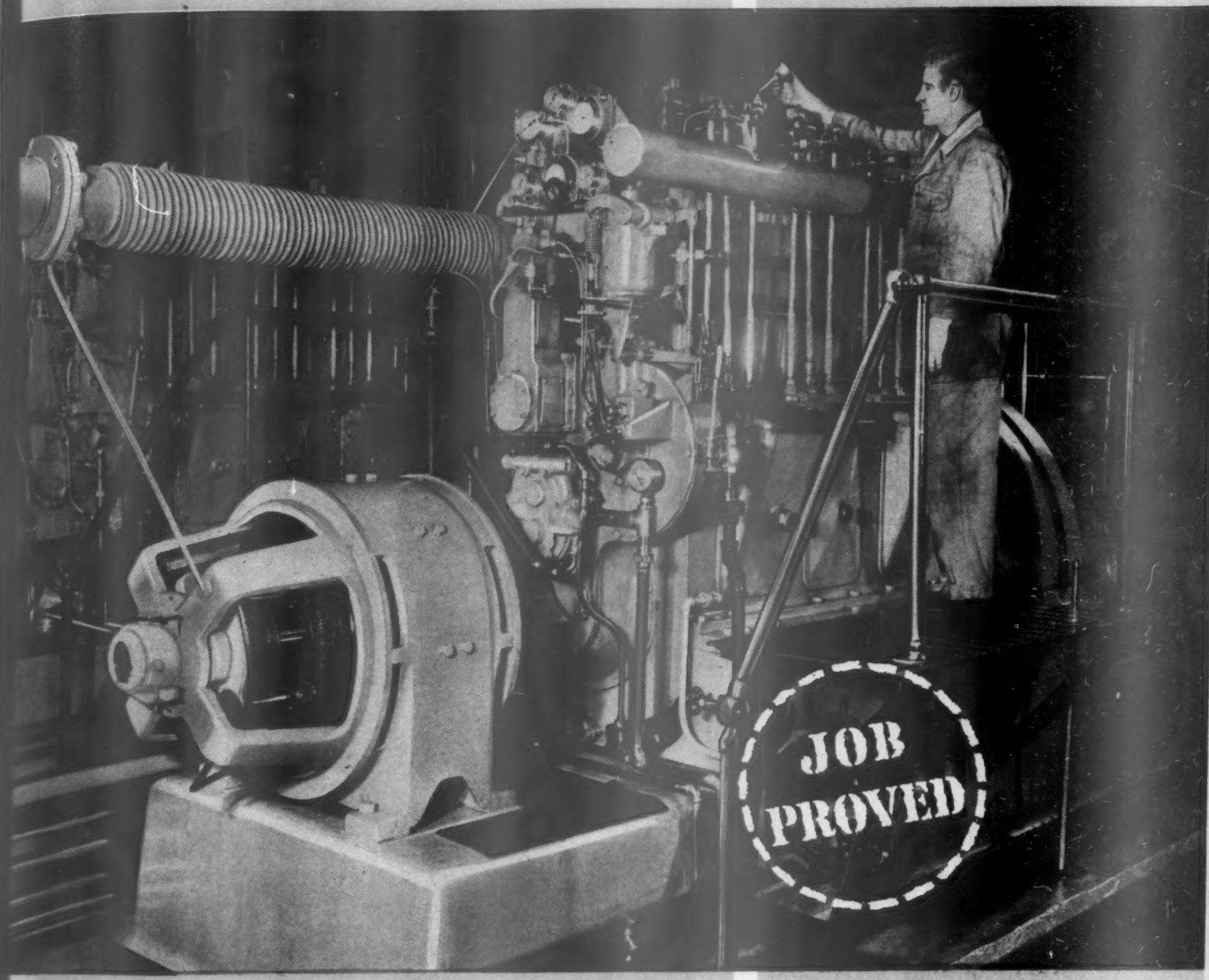
27. Always protect running cable from rubbing against rough surfaces.

28. Never tighten a cable clamp so much that it cuts or unduly distorts the wire rope.

29. Retighten all cable clamps after an hour's running time and test at all regular inspections.

30. Never permit a wire rope to kink. Avoid kinking manila rope.

Two Years Without Repairs, Replacement or Overhaul



SUN DIESEL LUBRICANT . . .

Keeps Two Diesels in Perfect Condition and Puts an End to Frequent Overhauls

A municipal plant which uses two 125-horsepower Diesels for pumping was confronted with a serious lubrication problem. Oil was forming sludge with the result that frequent shutdowns and overhauls were necessary.

A Sun Engineer was called in and after careful analysis recommended a Sun "Job Proved" oil specially refined to stand up under the particular operating conditions.

With Sun oil in the crankcases, the engines were kept in regular service for more than two years. Sludge disappeared. Oil consumption dropped. Mechanical repairs, replacements and overhauls were reduced to practically nothing. There was no excess carbon formation.

The ability to solve problems like this is typical of "Job Proved" products and of Sun Engineers. Wherever you have a tough problem involving petroleum products, whether in power plant, machine shop, mill or factory, call your nearest Sun office or write Department F11.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

In Canada: Sun Oil Company, Ltd. — Toronto and Montreal

SUN

SUNOCO

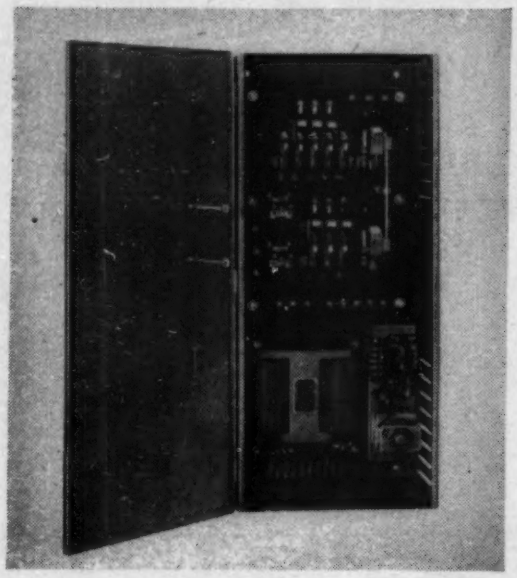
INDUSTRIAL PRODUCTS

WHAT'S NEW IN EQUIPMENT

Briefed here — for the convenience of plant operating men — are descriptions of industrial plant equipment newly placed on the market

MOTOR STARTER

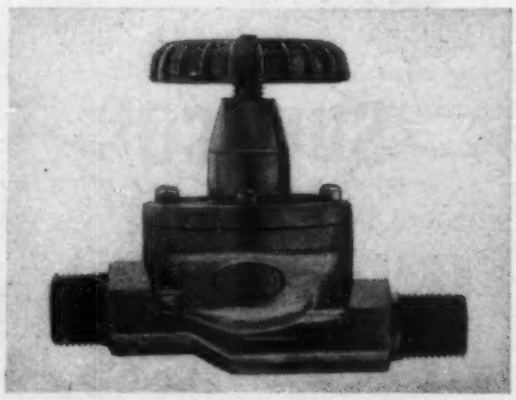
Bulletin 4051 a.c. automatic motor starter is non-reversing autotransformer type. Suitable for single-speed, two- or three-phase squirrel cage induction motors driving pumps, fans, M-G sets,



compressors, and other equipment. It can be used where inrush starting currents must be reduced, or where motor starting torque requires adjustment. In dripproof enclosure, the starter is arranged in three removable sections — contactor panel, timer panel, and multi-tap autotransformer. Provides accessibility to individual components. Adjustable time limit acceleration, overload protection, mechanical and interlock protection, and adjustable taps on the autotransformer are provided. Suitable for use with motors up to 100 horsepower, 550 volts, 60 cycles. Ward Leonard Electric Co., Mt. Vernon, N. Y.

STATION OUTLET VALVES

Combined shut-off and check valve, for use on drops or risers of a piping system, is diaphragm type. As a shut-off valve, it permits repairs or alterations on equipment downstream from the valve without disturbing other stations on the line. As a check valve, it allows the flow of gas in only one direction. Closes tight if a disturbance at the torch causes a back-pressure to the valve. Body, bonnet, and handwheel of the ½-inch valve are brass forgings. Several independent outlets can be connected to one service drop. It can be dismantled and reassembled quickly. A plug and chain assembly may be obtained. Air Reduction Sales Co., 60 East 42nd St., New York 17.

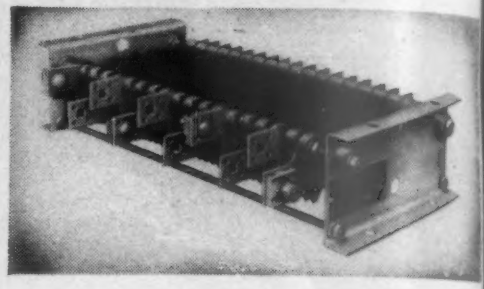


SCREW ANCHORS

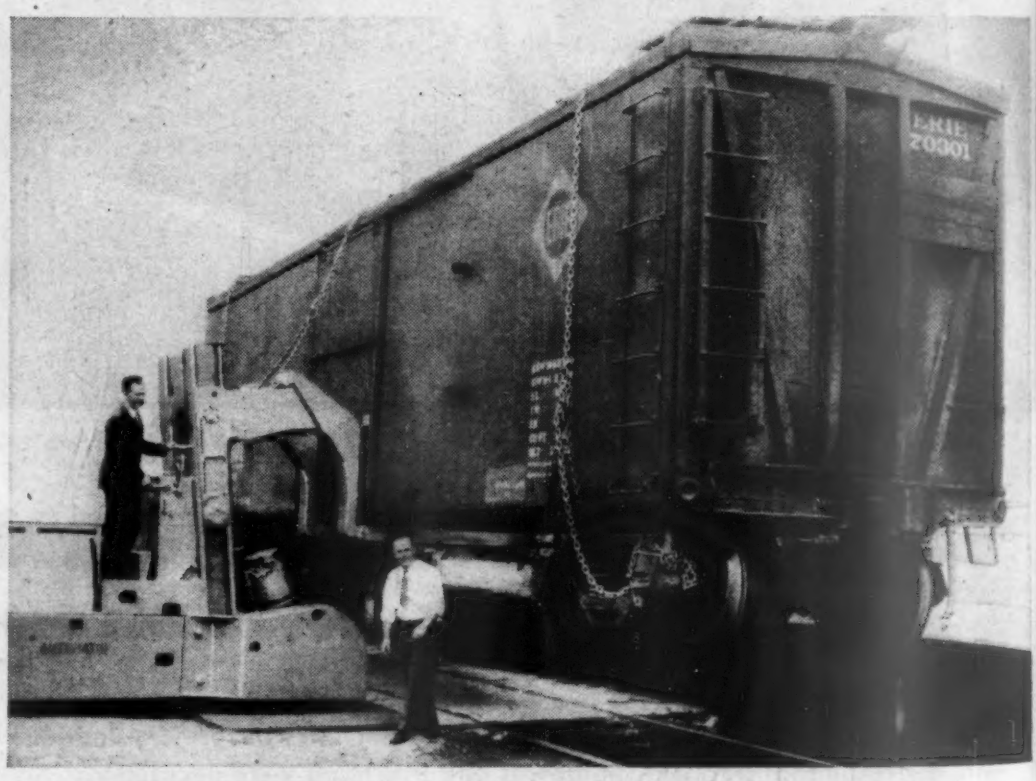
All-purpose screw anchor, known as the Sandscott Plastic Expanding Anchor, may be used with wood or lag screws for fastening into any material. Overlapping internal and external slits give a "concertina" expansion. The plastic is claimed to have 5000-p.s.i. tensile strength, to be unaffected by water, moisture, weather, or acids, and to be immune to age and corrosion. Also to withstand temperatures to 78 degrees below zero, or up to 180 deg. F., and to be shock- and vibration-proof. Made in seven sizes, to accommodate all lengths in screw sizes ranging from No. 5 to 20, or ¼- and 5/16-in. lag screws. Holub Industries, Inc., Sycamore, Ill.

MOTOR STARTING RESISTORS

Built for electric motor controller and starter duty, Tab-Weld plate resistors consist of individual grids stamped from



flat-rolled, corrosion-resistant, chromium alloy steel. In the non-breakable resistor sections, the ends form a continuous path. Terminal plates for external



FORK AND RAM TRUCKS

Ranging in capacity from 10 to 30 tons, Skylift Giant fork and ram trucks are built for steel mill operations, die-handling, and similar functions in heavy-industry plants. The truck is powered by a 4-wheel front drive assembly, with twin drive units for the two pairs of wheels. This design is said to reduce weight of the truck. The load itself automatically provides traction. The drive units, operating through fully enclosed helical bevel and spur gear reduction, are accessible for maintenance. Maneuverability is provided by full differential of the four drive wheels. Each of the two drive unit axles is pivoted to provide compensation for roadway obstructions. The high-pressure hydraulic lift operates through a multiple-action 3-cylinder ram pushing directly against the cantilever. The truck is claimed to handle its rated load capacity in steel coils as wide as 108 inches. Automatic Transportation Co., 149 West 87th St., Chicago 20.

"Right Away is Right!"

THERE was no delay in procuring the special fitting shown above. It was fabricated on the spot, when needed, with a standard TUBE-TURN welding elbow taken from the nearby TUBE-TURN distributor's stock.

Thus, TUBE-TURN welding fittings and the welder's art save time and money on special applications in countless variations.

TUBE-TURN welding fittings are particularly suitable for pipe fabrication because of the uniform wall thickness and full circularity which allows them to be successfully cut and joined in special ways. They are uniform from fitting to fitting. Order two or a thousand TUBE-TURN welding fittings of the same size and part number—they will be dimensionally alike.

The extent of the TUBE-TURN line is a big advantage in solving many different problems of pipe engineering and fabrication. There are more than 4000 different types and sizes of TUBE-TURN welding fittings and flanges. They come in many metals and alloys. For details, contact your nearest TUBE-TURN distributor. For his name, write to—

TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY

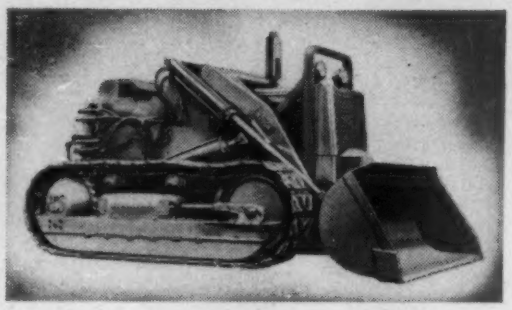
District Offices at New York, Philadelphia, Pittsburgh, Detroit, Chicago, Houston, Tulsa, San Francisco, Los Angeles

TUBE-TURN TRADE MARK *Welding Fittings and Flanges*

connections are also welded on. In place, the offset resistors form a zig-zag pattern, with the ends of two adjacent resistors in contact on one side and separated on the opposite side of the section. Molded insulating spacers, which will not soften below 2000 deg. F., are used between the separated ends. Terminal clamp-blocks have grooves to accommodate several sizes of wire. Flat bus may be bolted on. Available in several capacities, sections are of the same width, length, and height. The Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland, 4.

BULLDOZER SHOVEL

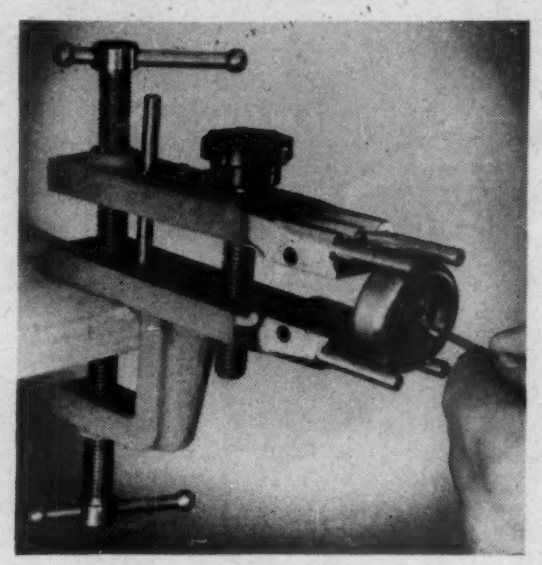
Designed in the International TD-14 diesel tractor, the 2-yd. Model 14 bulldozer shovel has a large-capacity front-mounted hydraulic pump, direct-connected to the engine crankshaft. A single lever is used to raise, lower, hold, or "float" the bucket, or to apply down



pressure when hard digging is encountered. In addition, the bucket may be dumped partially or completely at any height, and returned, by hydraulic power. An automatic tip-back tilts the bucket 38 degrees, in carrying position. The tracks oscillate freely, to conform to ground contour. Front end superstructures are eliminated. The bucket extends the full track width of the tractor. Frank G. Hough Co., Libertyville, Ill.

BRONZE VISE

Called Bench-King, vise of solid bronze has tool steel fingers to secure work of odd shapes without any special set-up



or holding arrangement. Six receptacles in the front of the vise jaws permit rearranging the fingers to accommodate the different shapes and sizes. There are also two holes on each side of the vise for using various combinations of the fingers. Ground surface on the inside of the jaws prevents marring delicate work. The jaws can hold work from .001 to 2½ inches thick. When reversed, the tool can be used as a small screw press for forcing and driving small work. Benj. Uydess & Sons, Inc., 962 East 167th St., Bronx 59, N. Y.

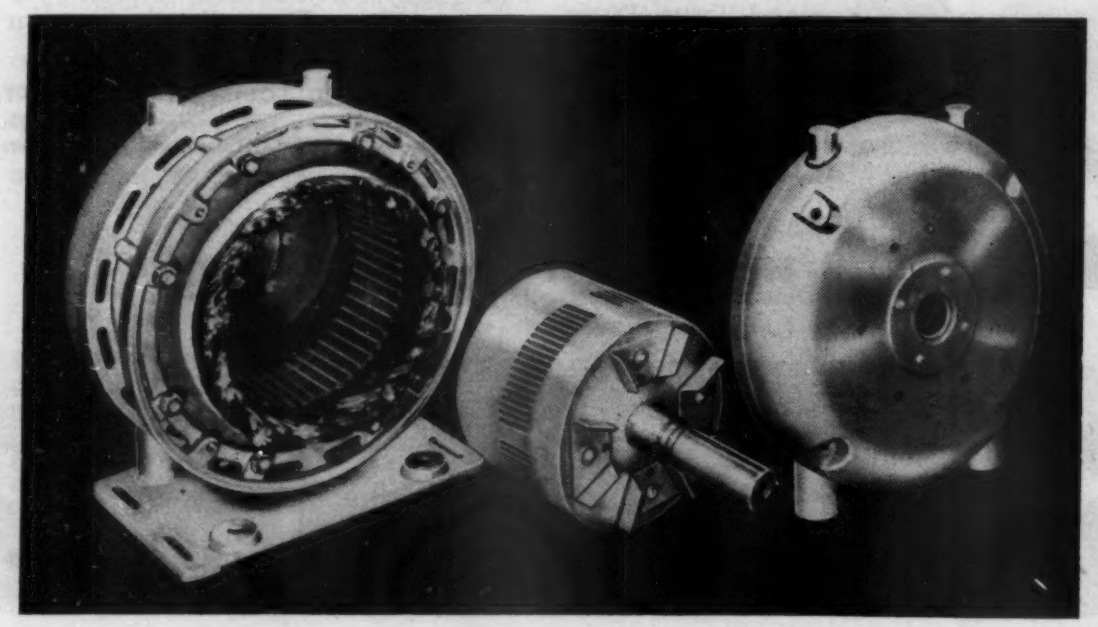
LOW VOLTAGE WELDER

Smaller Flexarc line of a.c. welders has reactor and transformer built around high permeability Hipersil steel cores. Called the "65 Line" for the open circuit voltage, the welders are said to assure high arc stability in the lowest as well as the highest current ranges of the five output ratings — 200, 300, 400, 500, and a duplex 300/600 amperes. Low voltage control and capacitors are built in. Includes natural ventilation, and movable core reactor operated by single ball crank current adjusting mechanism. Fan cooling is employed in the 500

ampere ratings. Portable units have heavy-duty casters, and the stationary welders have strap skid mountings. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30.

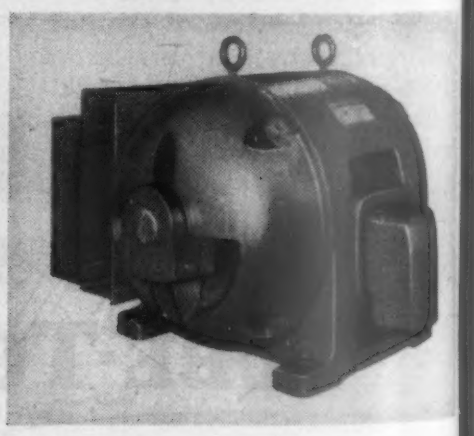
GENERATOR

Utilizing permanent magnets, shielded to avoid loss of magnestism, a generator is available in 60- and 400-cycle types, single- and three-phase, in outputs ranging from 300 watts to 30 kilowatts. The elimination of exciters, sliprings, commutators, brushes, and so forth, reduces maintenance. The generator is said to be unaffected by overloads and short circuits. Has no exposed electrical connections, and resists dust and moisture. Resistance to explosion, improved operation at high altitudes, and fast recovery of terminal voltage after removal of overload and short circuits, are also claimed. Output voltage is practically independent of temperature. The generator is adapted for outboard mounting on a gasoline or diesel engine. The rotor may serve as the engine flywheel. Kober Electric Co., Arlington, Va.



FREQUENCY CONVERTER

Power for high-speed a.c. motors (for grinders and drills) is supplied by Tri-



Clad Type AKC inductor frequency converter. The self-excited, self-driven machine provides 3-phase power at frequencies from 360 to 2160 cycles, ½ to 150 kilowatts. The cast rotor revolves in a stator having two windings. Control consists of a magnetic switch with standard thermal-overload relay on the input, or primary side. The secondary, o

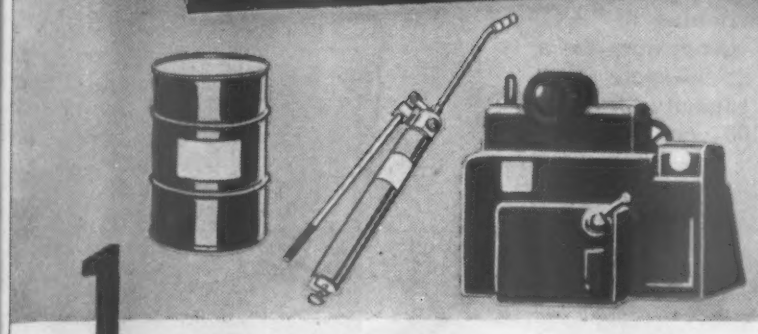
FAMOUS 4 STEPS

THAT LOWER LUBRICATION COSTS

Thousands of Industrial Plants Now Use the

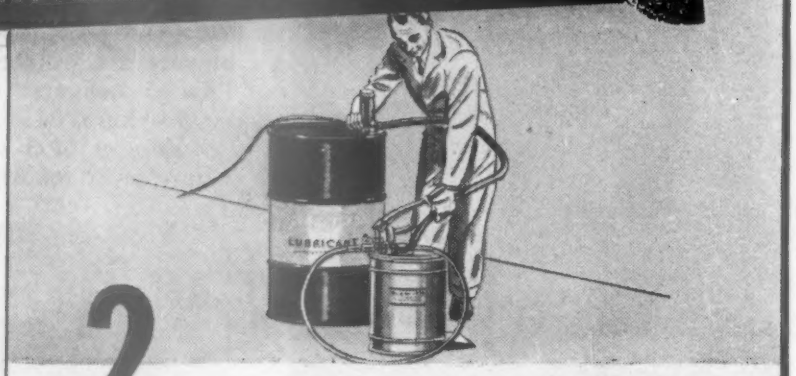
ALEMITE *Barrel-to-Bearing* SYSTEM

to Simplify Lubrication Methods



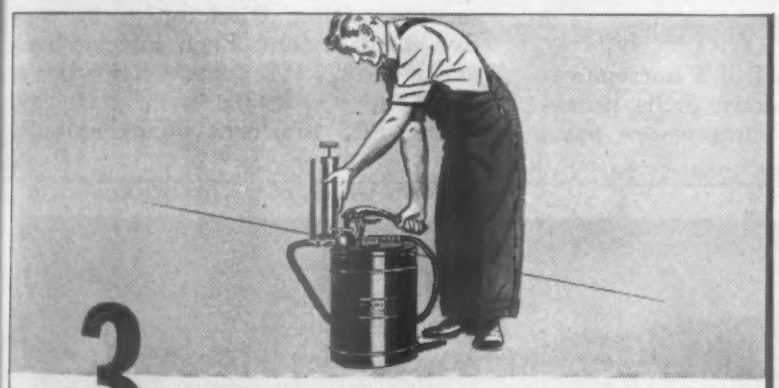
1 IDENTIFICATION

The Alemite Coloroute Plan provides a "foolproof" plan of lubrication procedure. Lubricant drums, lubricating equipment and lubrication points on machines are color-marked to prevent misapplication. These color symbols tell *what* kind lubricant is needed *where* and *when*.



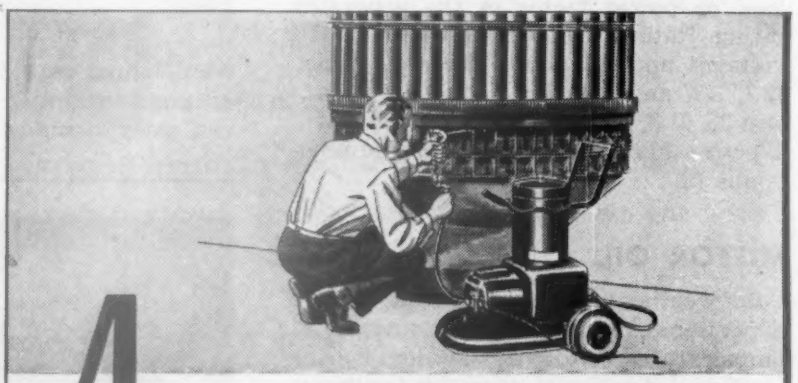
2 TRANSFERRING

Alemite Transfer Pumps. Oils and greases are quickly and easily transferred from original drums. The lubricants are not touched even by the oiler's hands. It's the clean way to handle lubricants—there's not the slightest chance for contamination.



3 LOADING

Alemite Hand Gun Loaders save time, money and lubricant. Adapter on the hand gun fits a valve on the loader pump. You simply pump the handle until it locks automatically which shows the gun is full. No air pockets in the gun. No mess or waste.



4 APPLYING

Alemite Hand Guns . . . and Powerguns. The hand guns and powerguns have the "drive" that forces lubricants to all bearing surfaces under *high pressure*. You not only get a faster, more thorough lubrication job but you also flush the bearings by forcing out old grease, dirt and moisture.

The famous Alemite Barrel-to-Bearing System of lubrication is the result of many years of experience dealing with industrial lubrication problems. Out of this experience has come new and better equipment and methods that have saved industry hundreds of thousands of dollars. Shown on this page are just a few of the items developed by Alemite engineers. For additional information, call your Alemite Jobber, or write to Alemite, 1870 Diversey Parkway, Chicago 14, Ill.

Another Product of STEWART WARNER

ALEMITE

REG. U.S. PAT. OFF.

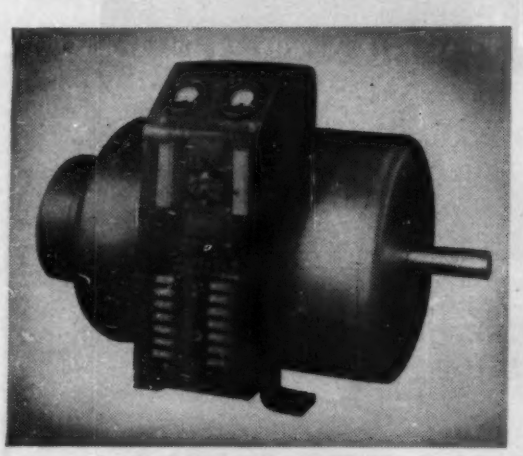
Alemite **ALONE** *Combines all 3 in Lubrication*

1. EQUIPMENT 2. PROCEDURES 3. LUBRICANTS

output high-frequency, circuit requires conventional thermal-overload protection. Applications that employ series capacitance should be provided with three fuses in the output circuit, maker states. Full-voltage starting is recommended, although reduced-voltage starters may be used. General Electric Co., Schenectady 5.

GENERATOR

"Packaged" unit includes revolving-field generator, direct-connected exciter,



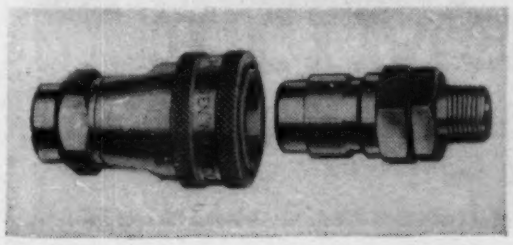
automatic voltage regulating circuit, meters, and selector switch for presetting voltage. The only external connections needed are leads to a generator switch. The built-in automatic voltage regulating circuit has no moving parts, and requires no maintenance. It is adjusted to hold terminal voltage within 2 per cent of the voltage selected, at any load or power factor in the generator rating. Ratings of 60 cycles at standard voltages and 0.8 power factor include: 18.7, 25, and 31.3 k.v.a. at 1200 r.p.m.; and 25, 31.3, and 37.5 k.v.a. at 1800 r.p.m. Electric Machinery Mfg. Co., Minneapolis 13.

MOTOR OIL

Cold weather motor oil is said to give dependable lubricating performance at temperatures as low as −30 deg. F. According to the manufacturer, it facilitates starting in extreme cold, stands up well when engine warms up, and lubricates efficiently even in sudden warm spells. Suitable for trucks, tractors, and other vehicles. Amalie Div., L. Sonneborn Sons, Inc., 88 Lexington Ave., New York.

COUPLING

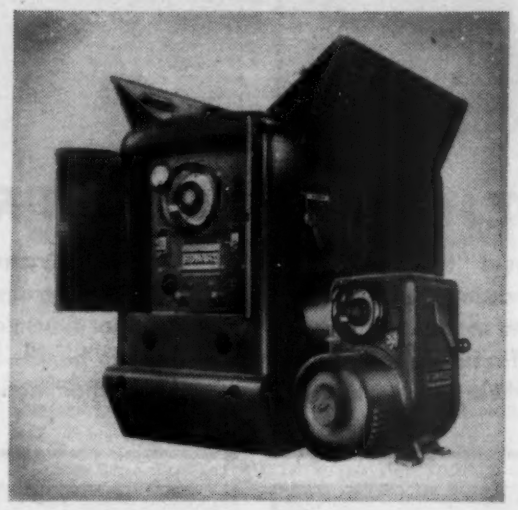
Both members of Series 8000 quick-connect coupling seal automatically when disconnected. The coupling is suitable for hydraulic or pneumatic fluid lines. Valves are located in socket as well as in plug, and both valves are opened automatically by inserting plug in sock-



et. When coupling is connected, an "O" ring packing seals against leaks. Connection is made by pulling back sleeve and pushing plug into socket. The socket is made with ⅜-, ½-, or ¾-in. female pipe thread, male pipe thread, hose stem, or hose clamp connections, and the plug with ⅜- or ½-inch. Hansen Mfg. Co., 4031 West 150th St., Cleveland.

COMBINED WELDER-POWER UNIT

Gasoline engine-driven rotary a.c. arc welder is combined with an a.c. power unit. Throwing change-over switch to "Welder" provides a high-capacity 200-ampere arc welder. Switching to "A.C. Power" converts the generator to a single-phase, 110-volt, 60-cycle a.c. power unit of 5-kw. capacity. It provides power for fifty 100-watt lamps or

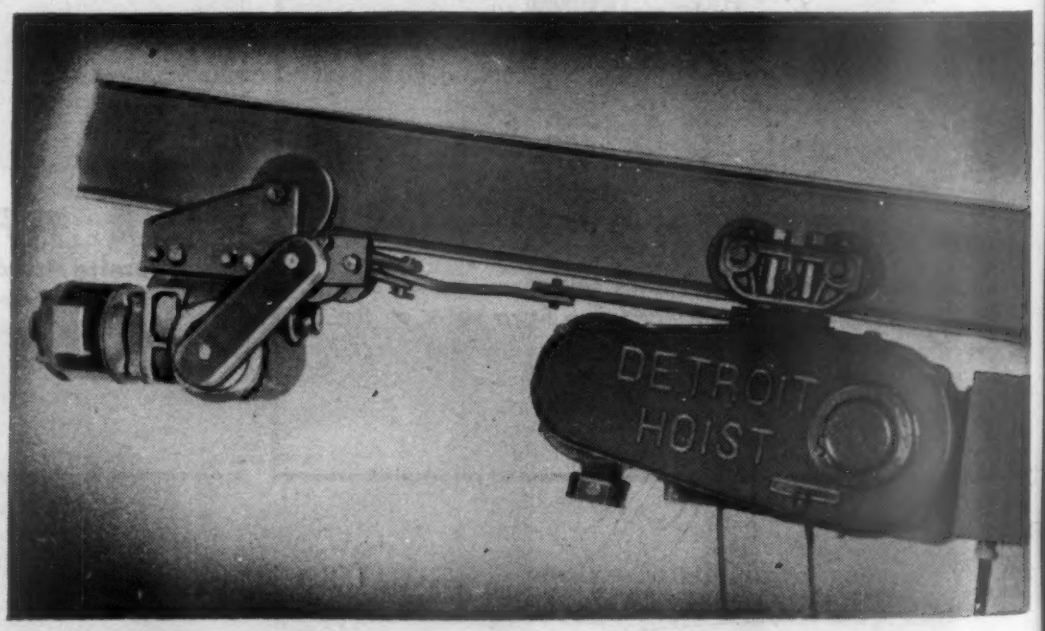


flood lights, or a total of 6 horsepower of motors running electric drills, grinders, saws, hammers, compressors, paint sprayers, and elevators. Also suitable for emergency use on motors; blowers; and heating, cooling, and other equipment. The Hobart Bros. Co., Troy, Ohio.

LUBRICANT INJECTOR AND PUMP

Type SL-3 lubricant injector has two moving parts, the valve stem and piston. They operate in packings of oil- and grease-resisting Linpak material, which compensates for normal wear. The in-

jectors are available singly or in manifolds of two, three, or four. Mounted either vertically or in horizontal position on machines, they may be individually set for each bearing. Spring lock secures setting. Discharge is by positive displacement. Each injector block has a ⅛-in. I.P.T. female connection at each end. Outlet is ⅛-in. O.D. tube. Model 1825 lubricant pump, an auto-



MONORAIL TRACTOR

Called Trojan, an electric-motor-traveled monorail tractor can be used to move existing hand-operated monorail hoists by power; also to move monorail conveyor lines; and to open and close garage and large hangar doors. In slightly altered form, it can move hand-operated crane bridges. The tractor is suspended on a pair of wheels that run on the top surfaces of an overhead monorail beam flange. Weight exerts a pressure against a second pair of wheels on the under side of the flange. This construction permits the small, lightweight tractor to move comparatively heavy loads up inclined as well as along level monorails. Detroit Hoist & Machine Co., 8226 Morrow St., Detroit 11.

Can I fill my Hose Requirements with pre-war quality goods?

Your Thermoid Distributor* Will Know!

He will tell you *No.* Today's products carrying the Thermoid trade mark are even better than pre-war quality. War born experiences plus latest technical advances provide the added quality. This new quality is in production . . . it is no longer necessary to take whatever you can get.

He can also tell you—

That Thermoid hose is made in a wide range of types and sizes. And, every type measures up to the service conditions for which it is sold.

He knows something about Thermoid too—

Thermoid concentrates its manufacturing for industry on the well integrated line shown below. The Company itself, is large enough for precise, low cost, high quality production, but small enough to be quickly responsive to customers' specific problems. That's one of the reasons why—

It's Good Business To Do Business With Thermoid!

*A postcard or a letter to the home office will bring his name and address to you.

Manufacturers of new equipment are invited to correspond direct with the home office.

Thermoid
PRODUCTS FOR INDUSTRY
BUILT FOR THE JOB
QUALITY VALUE SERVICE

Thermoid Products

Automotive • Industrial
Oil Field • Textile

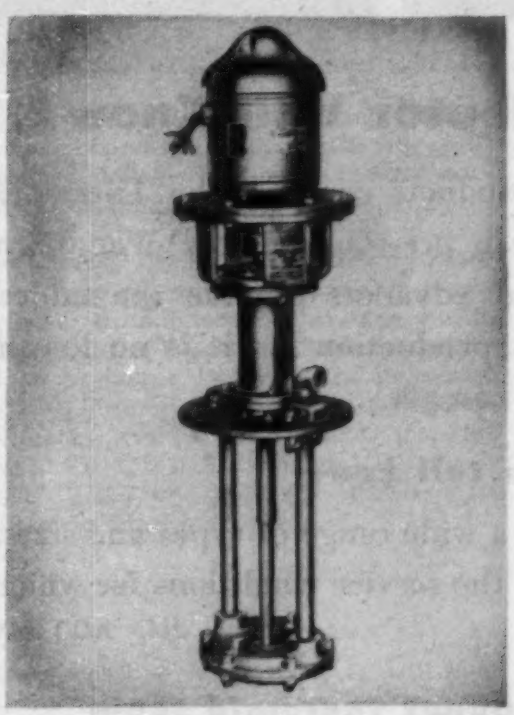
Thermoid Company, Trenton, N. J., U. S. A.

The Thermoid Line Includes: Industrial Brake Linings and Friction Products • Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Custom Molded Parts.

matic, air-motor-powered unit, may be operated to cycle the Centro-Matic Lubrigun system at pre-determined intervals. The enclosed pumping unit is located under the 60-lb. capacity lubricant container. Pressure ratio is 70 to 1. Vent valve is set for 2500 p.s.i. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis 20.

PIT PUMP

Built for operations requiring a simple, wet pit type pump, and where no submerged bearings can be used, the SW-O overhead bearing pump can be used for heavy liquids, hot liquids (up to 1000 deg. F.), or for liquids containing solids. The anti-friction bearings of the vertical shaft pump are supported on a pedestal attached to floor plate. The individually-lubricated shaft and bearings are designed for heavy loads. The pump can be belt- or motor-driven. Type SW-OB is made with the entrance from the bottom for handling mixtures con-



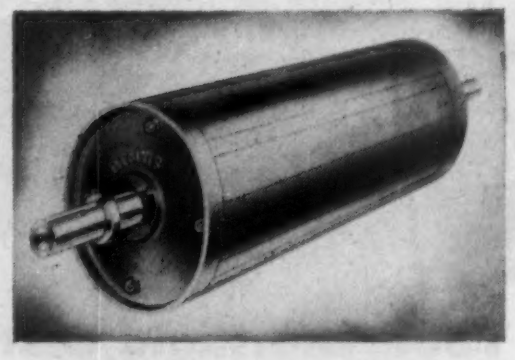
taining quick-settling solids; or for intermittent operation where the inverted impeller of the other pump might become loaded with solids when stationary. No stuffing box is necessary, because the SW-OB is constructed for submerged operation. Nagle Pumps, Chicago Heights, Ill.

LUBRICATING OILS

Type 710 silicone oils, for use as lubricants at temperatures ranging from 10 to 500 deg. F. (–12 to 260 deg. C.), are suitable for timing mechanisms, precision instruments, and oven conveyors. Also can be used as a high temperature bath or as a hydraulic fluid where high temperatures are involved. Type 710R contains a corrosion inhibitor, and provides permanent lubrication for sealed-in precision devices such as clocks and instruments exposed to high or normal temperatures. Type 710G, containing colloidal graphite in suspension, lubricates mechanisms continually exposed to extreme heat, weather, or high humidity. Dow Corning Corp., Midland, Michigan.

MAGNETIC PULLEY

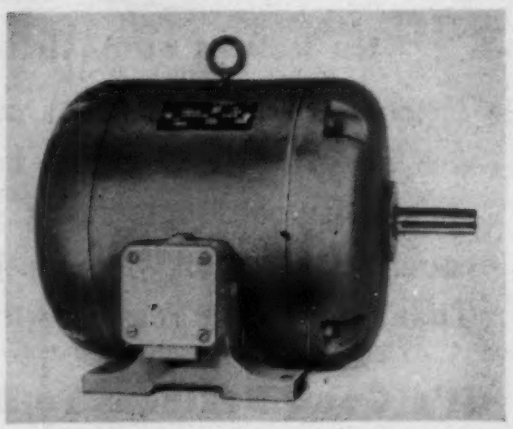
Perma-Pulley, a permanent magnetic pulley with Alnico poles, is made in 53 sizes ranging from 12-in. diameter by 12-in. width, to 30x60 inches. Used as head pulleys in a belt conveyor system, or in a self-contained magnetic pulley-type separator, the magnets remove metal scraps from non-magnetic materials carried on the belt. Eliminates need for electric wiring. The pulley has a crown face, to prevent belt weaving, and to equalize distribution of the bur-



den across the belt as it passes over the pulley. Shaft diameters are standard. The head plates are non-magnetic. Dings Magnetic Separator Co., 509 East Smith St., Milwaukee 7.

ENCLOSED MOTORS

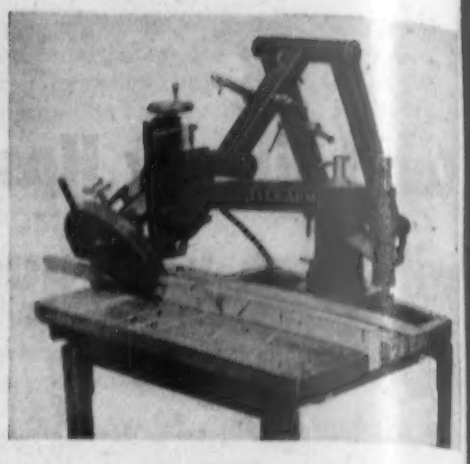
Totally enclosed 3-phase motor is made in 1½-, 2-, and 3-hp. sizes. The squirrel cage rotor utilizes rolled sheet copper bars for uniformity and low internal rotor resistance. The 1½-hp., 1160 r.p.m. motors operate on 2.6 amperes, 440 volts, 60 cycles. The rotor is equipped with Norma-Hoffman grease-sealed cartridge type bearings. Stator windings are coated



with baked-on varnish. A cast iron outlet box threaded for proper size of conduit is mounted on side of motor. Frame and endbells are of cast iron. Includes lifting ring. Kato Eng. Co., Mankato, Minn.

RADIAL SAW

Flexibility of operation and quick setting for any cut at any angle are claimed for radial saw. Has cast aluminum alloy arms; steel collars, guards, and frame;



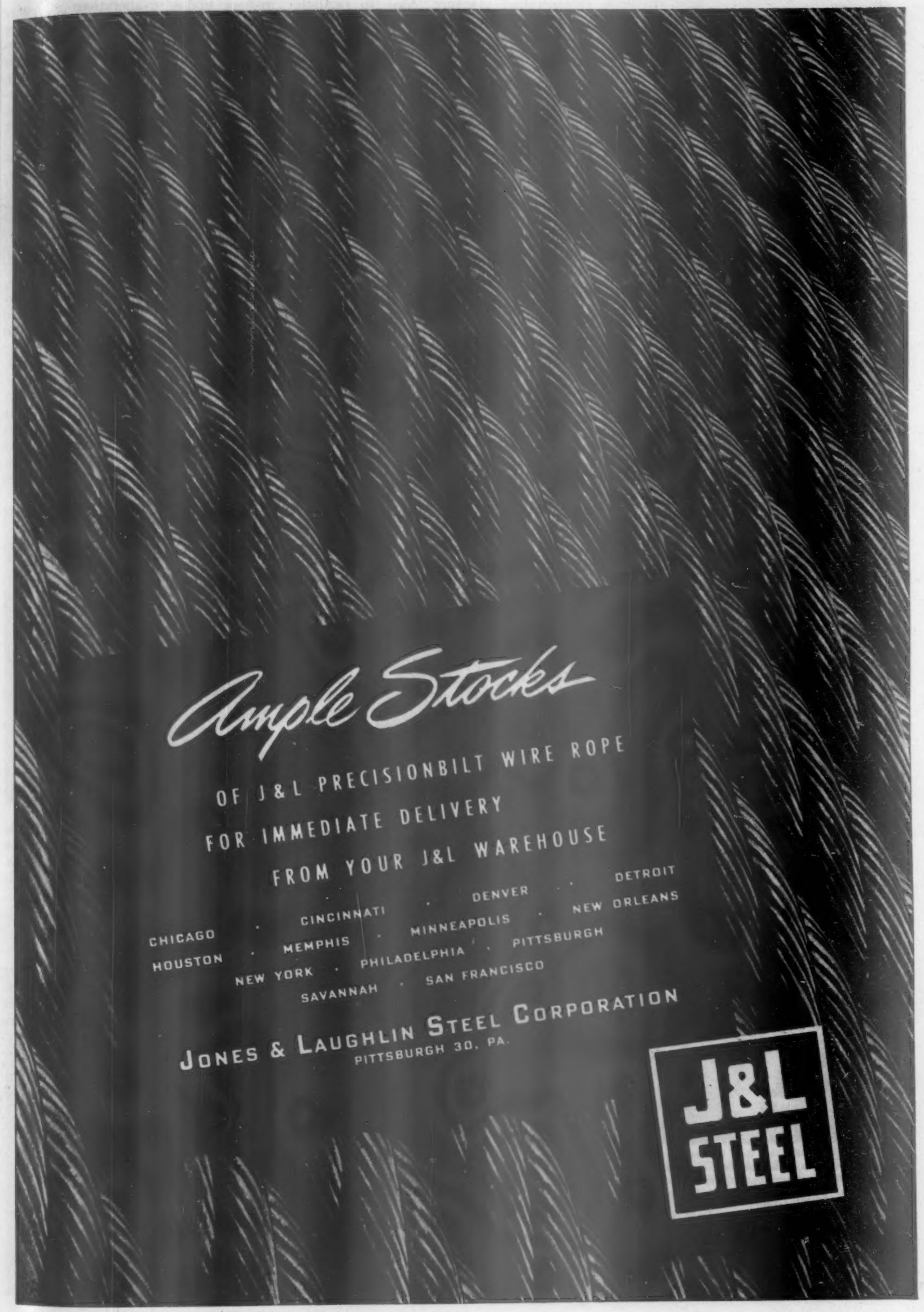
removable rip guard equipped with anti-kickback dogs; and can be lowered to cover blade and shaft. Arm is provided with needle bearings, and swings on hardened precision ground shaft. Bearings are enclosed – there are no open tracks. Saw will not creep forward, according to the manufacturer, and has retracting device. The 2-hp., direct-drive, universal, single-phase motor operates on 115 volts, 25-60 cycle a.c. or d.c., 5700 r.p.m. load speed. Flex-Arm Mfg. Corp., 401 South Pasadena Ave., Pasadena 2, Calif.

WIRE PROTECTOR

Snapon Wire Guard, a shatter-proof, water-repellent wire protector of transparent plastic, can be snapped on at friction points. It is designed to eliminate arcing and burning from current leakages by preventing fraying of wire insulation, by protecting and strengthening frayed wire, and by increasing the dielectric strength of the wire it covers. Light in weight, it is said to be stable and resilient at all temperatures, and to add little to overall wire diameter. Comes in 6-ft. sections which may be cut to smaller sizes. Any two sections interlock and overlap. Fits Nos. 4 and 6 wires. Martin M. Stekert, 45 West 34th St., New York 1.

PRESSURE CONTROL PILOT

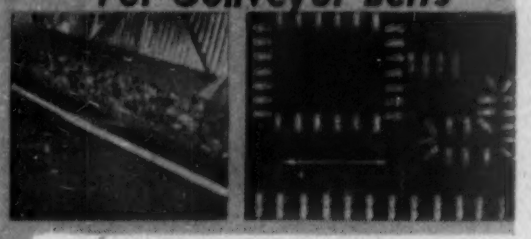
All-purpose pressure control pilot is built to control the action of a diaphragm regulating valve to maintain a constant


Ample Stocks
OF J&L PRECISIONBILT WIRE ROPE
FOR IMMEDIATE DELIVERY
FROM YOUR J&L WAREHOUSE
CHICAGO · CINCINNATI · DENVER · DETROIT
HOUSTON · MEMPHIS · MINNEAPOLIS · NEW ORLEANS
NEW YORK · PHILADELPHIA · PITTSBURGH
SAVANNAH · SAN FRANCISCO
JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.
J&L STEEL

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

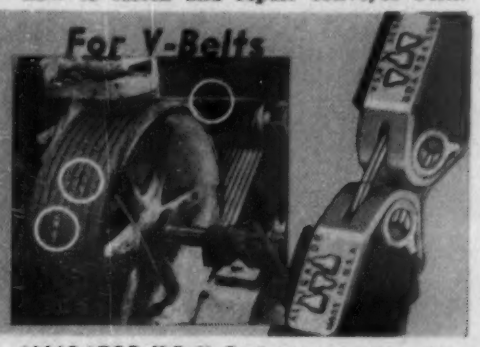
For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips that can be repaired with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

For V-Belts



ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts

ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅝" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

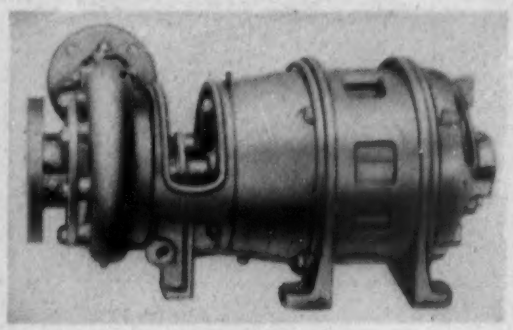
Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.

controlled pressure. Also to regulate operating pressure—air, clean gas, water, or light oil — to a standard diaphragm regulating valve in the flow line of the fluid to be controlled. There is no continuous leakage of operating pressure, and the pilot requires no attention over long operating periods, or recalibration during service, according to the manufacturer. Made in nine pressure ranges from ½ to 800 p.s.i. Leslie Co., 112 Delafield Ave., Lyndhurst, N. J.

CENTRIFUGAL PUMPS

Made in 17 sizes, models of Close-Cupld centrifugal pumps range in size up to



2000-g.p.m. capacity, with heads up to 400 feet. Pump and motor are combined in a single assembly, and operate in any position except vertically, with motor below pump. A single shaft eliminates a coupling. A machined stuffing box permits the use of a die-formed, semi-metallic packing with lantern-type liquid seal ring, or of a mechanical seal. Full length, removable shaft sleeve protects the main motor and pump shaft against liquid damage. Provision is made for the expansion and contraction of the sleeve. Halves of the split gland are held together with hollow washers which slip over bosses on the gland. Goulds Pumps Inc., Seneca Falls, N. Y.

HUMIDITY INDICATOR

Wet and dry bulb type humidity indicator has all-metal thermometers rang-

ing from 30 to 110 deg. F., each line representing one degree. The wet bulb has removable wick that covers the thermal element in a self-supporting manner. Reservoir is a heavy-walled, large-capacity jar which slides out, is large-mouthed for cleaning, and is covered to reduce undue evaporation. Simplified slide rule calculator indicates relative humidity from 10 to 100 percent. Fastened to the stand under thermometer scales, it can be moved to the left only, to prevent incorrect manipulation. Supporting stand can be swung, if desired, to create air movement. Changing wick and replenishing water is the only maintenance required. Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5.

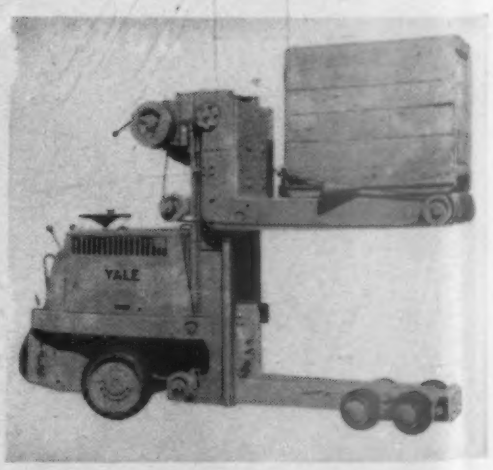
TRACTOR

Built to tow trailer trains, the Jack-Tractor may also be used as a pushing unit. It is powered by a 6000-lb. capacity power JackLift master drive unit, and has a maximum drawbar pull of 500 pounds. Towing hitches are furnished. All controls can be operated with handle in vertical as well as in other positions enabling operator to maneuver the tractor in close quarters. The electric brake applies as soon as the handle triggers are released. The master drive unit may be replaced in 20 minutes, maker says. Collector rings and brushes have been

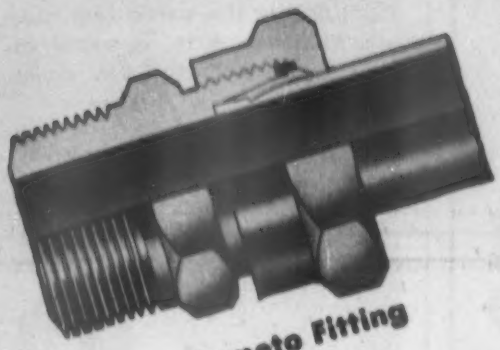
eliminated. The tractor is powered by a storage battery providing a work span of 8 to 10 hours with maximum loads. Lewis-Shepard Products Inc., 297 Walnut St., Watertown 72, Mass.

ELECTRIC LIFT TRUCK

Electric high-lift platform truck features pulley and cable arrangement, adjustable for mechanically sliding materials on and off the truck platform at differ-



3 SIMPLE RULES FOR A PERFECT FIT



Ermeto Fitting

Compression Tee

S. A. E. Elbow

Pipe Coupling

AN Tube Fitting

Inverted Tee

HERE ARE three simple rules that will help you to quickly solve your "fittings" problems.

1. Decide what style fitting you need. Is it an inverted, flared tube type? Is it an SAE flared tube type? Is it a compression type? Is it a pipe fitting? Is it an AN tube fitting? Is it an Ermeto* fitting?

Weatherhead is the world's largest producer of tube fittings and offers you a complete line for every purpose. These fittings are made in brass, steel, stainless steel, and aluminum from bar stock and forging.

2. Be sure it's made of the best possible materials. Typical Weatherhead fittings are machined from extruded brass bar stock to eliminate any danger of sand holes or other casting flaws. All have flat sides, making them easy to tighten or loosen with an open wrench. Acid baths and solution washes at the end of the high precision production lines delivers them bright and clean.

3. Buy it from a reliable manufacturer. The Weatherhead Company is the leading parts producer in more than a dozen industrial fields and manufactures thousands of different products which are described in numerous catalogs. Write us today and let us know what your needs are. We'll send you a catalog, promptly, which will cover all your tube fittings, flexible hose, hose assemblies or other needs.

*Trade Mark Reg. U. S. Pat. Off.

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND 8, OHIO

CLEVELAND • NEW YORK • DETROIT • CHICAGO • ST. LOUIS • ATLANTA • DENVER • LOS ANGELES

Weatherhead Products Include:

Power Brake Units • Jet Fuel Control Valves • Liquefied Petroleum Gas Regulators • Relief Valves • Flexible Hose Assemblies • Tube Fittings • Refrigeration Valves • Dehydrators

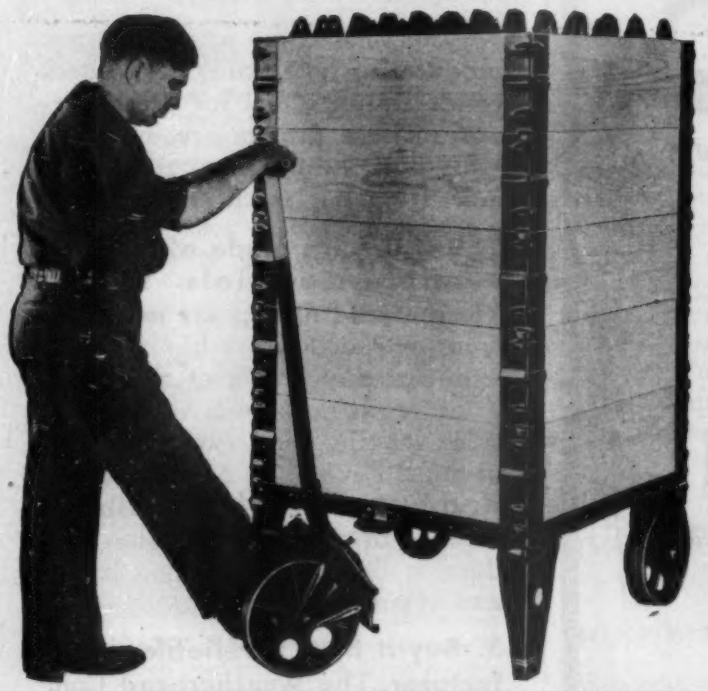
This Valuable *Free* IDEA BOOK

tells you how to

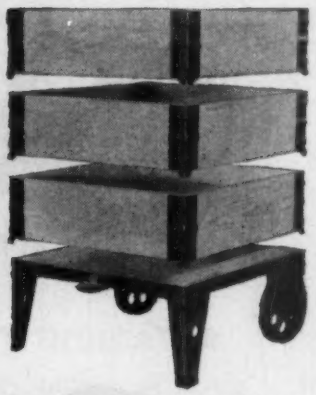
SAVE 50% *with*

FLOOR SPACE
LABOR COST
EQUIPMENT COST

THE TURNER SYSTEM OF MATERIALS HANDLING



Just off the press and full of new ideas on reducing handling costs, the TURNER SYSTEM BOOK shows the way to greater profit . . . describes a plan for cutting labor, handling, and storage expense, speeding production, reducing accidents . . . in almost any size plant. The book is sent without charge.



When you "DELIVER THE BIN AND SAVE THE HANDLING" you get up to 80% saving on the handling of small parts. Wooden-side or All-steel Bin Sections, Racks, Trays and Die Tables fit on the Turner Transport which is moved by hand Jimmy, power lift truck, crane or tractor.

Have you ever figured the time wasted when employees must reach down to bottom of over-size bin? Turner Bin Sections are removed as load diminishes, added as load increases.

Save Time, Labor and Space with Die Racks on Wheels

Turner System Die Racks mounted on Transports are moved quickly without waiting for lift trucks. These racks protect valuable dies, insure orderly storage and enable prompt handling. Six styles and sizes described in the Turner System Book.

ASK FOR DETAILS OF OUR 60 DAY FREE TRIAL OFFER

SEND FOR YOUR COPY OF THE TURNER SYSTEM BOOK TODAY!

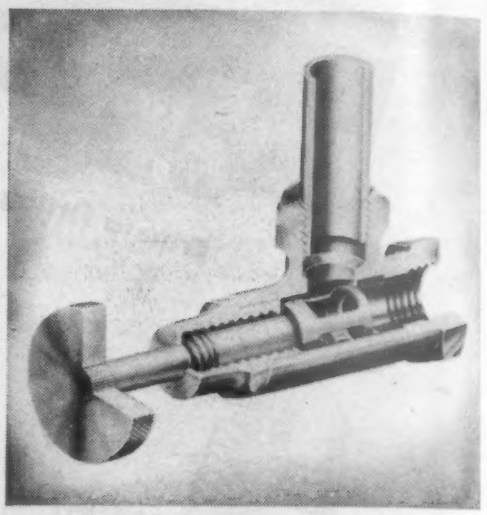
FACTORY SERVICE COMPANY

4605 N. TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

ent levels. Arrangements are on both sides of the truck. Cable hooks engage a bar — or one another — across one end of the piece, and an electric winch winds both cables simultaneously to move the load horizontally. The pulleys at the bottom of the frame are used when the truck platform is down. The 4-wheel forward outrigger and the structural design enable the truck to lift 6000 pounds. The Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24.

SEATLESS VALVE

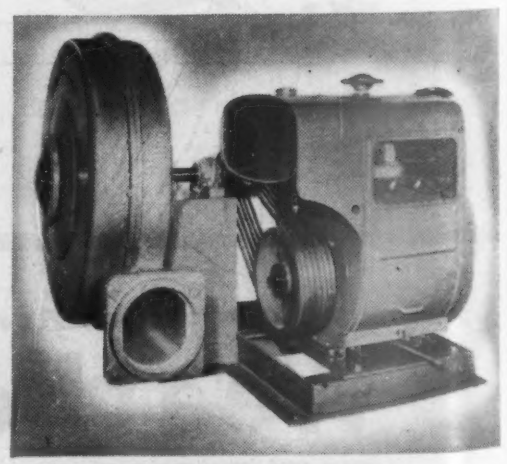
Eliminating the valve seat, washer, and all wearing parts, a valve opens and closes with a turn of the wheel, without



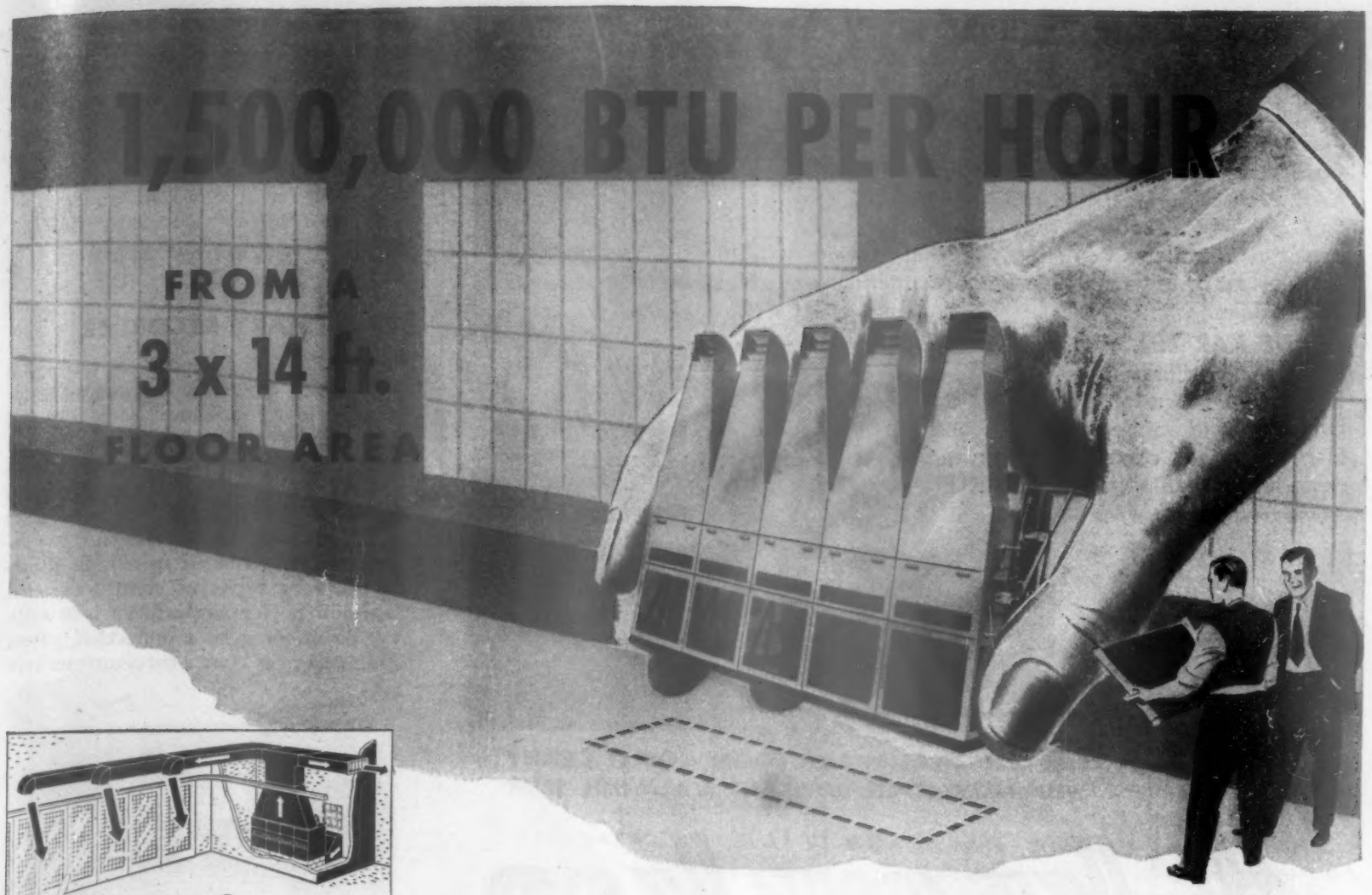
mechanical pressure. It cannot jam, according to the manufacturer, and no dirt, scale, or abrasive can affect operation. The shut-off is positive. No gland packing is necessary, and no fluid can come in contact with the threads. Hammering and chattering are also said to be absent, because pressure builds up gradually. Has polished stem that engages with two wear-resistant synthetic rubber collars—one at each end of the valve. Knowles-Fisher Corp., Gowanda, New York.

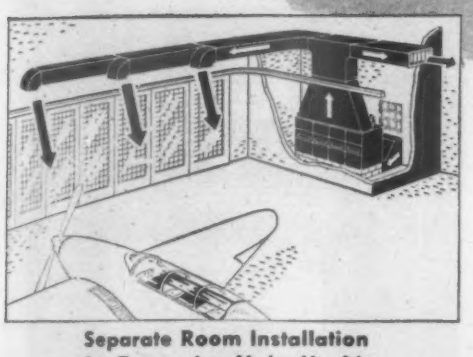
ENGINE-DRIVEN TURBO BLOWER

Internal combustion engine - powered turbo blower is designed for emergen-

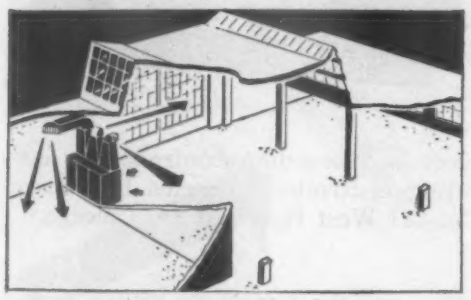


cies caused by power failures. The air-cooled engine, V-belt drives, and impeller jackshaft are accessible for greasing, cleaning, or adjusting. For combus-

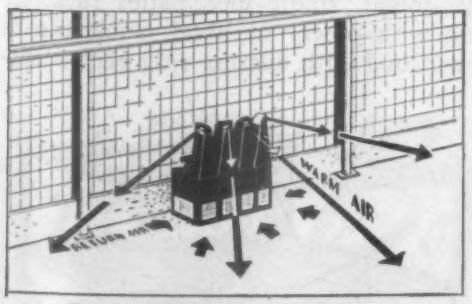




Separate Room Installation
for Tempering Make-Up Air



Split Type Installation
Showing Nozzle and Duct Discharge



Conventional Nozzle Discharge
Installed for Factory

Conventional Duct Installation
for Factory

Janitrol Heavy Duty Floor Type Unit Heater answers the need for clean automatic Gas Heat for large areas

NEED HEAT of 250,000 to 1,500,000 Btu per hour?

For complete, direct heating or duct distributed . . . for supplementary heating or make-up air?

Janitrol Heavy Duty Floor Type Unit Heaters are meeting these heating requirements in factories, public buildings, assembly shops, markets, hangars and many other large buildings of all types.

Advantages?

(1) Low installation and operating costs.

(2) Quick, clean, automatic heat, accurately controlled. Blower for each section assures full, uniform delivery without danger of hot spots.

(3) Compact design requires a small floor area, additional heating capacity can be added as heating requirements increase.

(4) Complete Btu capacity range is made possible by the assembly of multiple units. Each unit has an input rating of 250,000 Btu per hour.

(5) Combination of the famous Janitrol Multi-Thermex heat exchangers and Amplifier Ribbon-type burners, assures flexibility of throttling controls, rapid heat transfer, and efficient combustion.

(6) Factory assembled and tested to meet rigid specifications.

(7) Backed by the unmatched experience and reputation of Surface Combustion Corporation, for more than thirty years the leading producer of gas-fired heating and heat treating equipment for both industry and home.

If you are planning to build, remodel or expand, write today for complete specifications on Janitrol Heavy Duty Unit Heater Models.

Janitrol

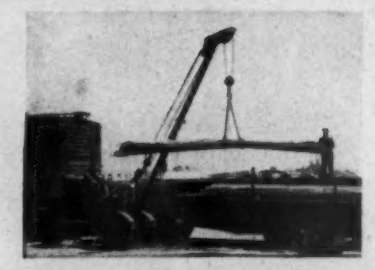
SURFACE COMBUSTION CORP., TOLEDO 1, OHIO

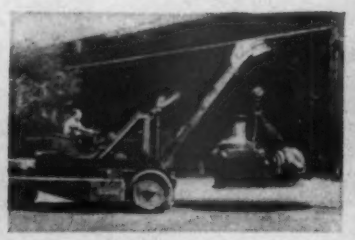
KRANE KAR REDUCES MATERIALS-HANDLING COSTS TO ABOUT 8¢ per TON

All businesses, big and small, are *mechanizing* their Materials-Handling Methods to cut costs. Case studies in various industries* show ***KRANE KAR*** REDUCES HANDLING COSTS TO ABOUT 8c PER TON . . . Loading and Unloading freight cars, trucks, trailers . . . Tiering, Stacking, Storing inside plant or in yard . . . in Plant Maintenance and Repairs.

KRANE KAR *lifts, swings, carries, and places loads* of any shape or size up to 10 tons. 9 to 37 ft. booms or adjustable telescopic booms; pneumatic or solid rubber tires; gasoline or Diesel. Electric magnet, clamshell bucket, and other accessories available. ASK FOR BULLETIN No. 69.

* *Names upon request.*





THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

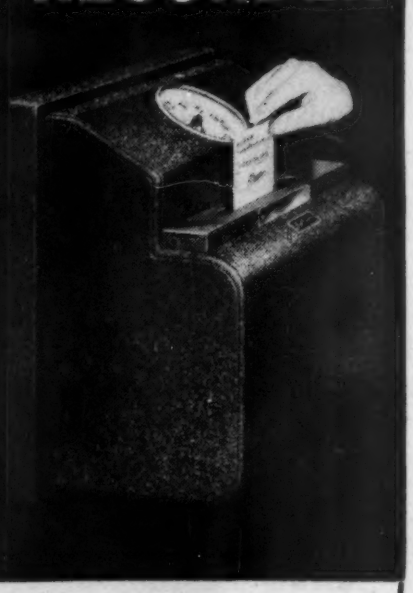
2½, 5, AND 10 TON CAPACITIES

KRANE KAR

TRADE MARK REGISTERED

SILENT HOIST & CRANE CO., 855 63rd ST., B'KLYN 20, N.Y.

THE SIMPLEX TIME RECORDER eliminates serious employee misunderstanding



The only way an employee can be satisfied that he (or she) is being paid for the actual time worked is to provide a foolproof means of recording time . . . one that leaves no loopholes for questioning.

Such a means is provided by the Simplex Trigger-Touch Time Recorder. This modern device makes records of work periods in a way that leaves nothing to chance either on the part of the employee or the clerical staff in the payroll department. There can be no guesswork . . . no cause for complaint . . . no time wasted . . . no recriminations. The facts are there for everyone concerned to see and *understand*. Payrolls are figured right the first time.

GET ALL DETAILS BY MAILING COUPON TODAY!

SIMPLEX TIME RECORDER CO., GARDNER, MASS.

Name..... Position.....

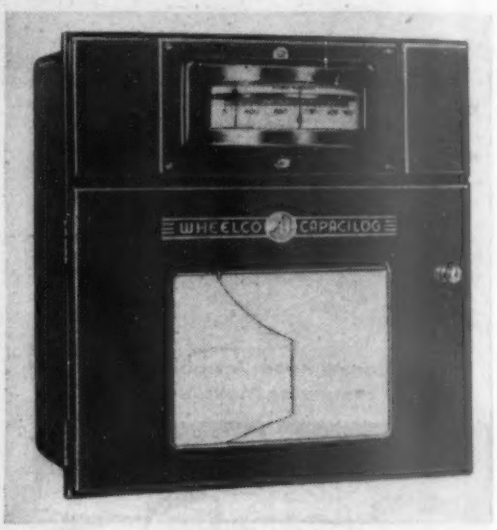
Company.....

Address.....

tion systems using oil burners, an oil pump may be obtained with the unit, built in as an integral part. The welded steel base permits belt tension adjustments without misalignment. A governor on the engine assures a steady speed for the turbo blower and the oil pump, providing for a constant air and oil pressure. The North American Mfg. Co., 4455 East 71st St., Cleveland 5.

STRIP CHART RECORDER

Named Capacilog Electronic Scriber, a strip chart recorder is designed for measurement, indicator, control, and permanent record of variables in the process industries. Recording function is performed by a power-driven pen. Has no relays or converters. Operating on 115 or 230 volts, 25, 50, or 60 cycles, the instrument is furnished in models utilizing different types of control systems. Maximum power consumption is 60 watts. May be obtained as a deflection, potentiometer, or resistance thermometer type



recorder, recording controller, or indicating controller. Wheelco Instruments Co., 847 West Harrison St., Chicago.

PALLET RACK

All-metal, single-face pallet rack, for use with power or hand truck, can be furnished with nesting ring permanent-

ly welded on. The units are of special rolled channel steel with reinforced, all-welded channel support. They are suited for handling heavy, irregular shaped

HARPER fastening NEWS

HAVE YOU A CORROSION PROBLEM?

New Harper Computer Will Show Proper Alloy Bolt to Use

FREE
ON REQUEST TO EXECUTIVES, ENGINEERS AND OTHERS INTERESTED IN FASTENINGS

The amazing new Harper Computer provides a rapid means of selecting the best non-ferrous or stainless steel alloy fastening to resist any one of numerous conditions causing corrosion. It operates on the slide rule principle and qualifies as Excellent, Good, Fair, or No Good, 13 rust and corrosion resisting metals or alloys in approximately 142 corrosive environments. To operate it, simply, select the name of the corrosive condition which most nearly matches your own. Slide this name until it is directly opposite the arrow. Look into the adjoining column for a set of symbols which indicate the non-ferrous or stainless steel alloy best suited to resist the corrosive condition in question. For example, silicon bronze may be indicated for condition A, Monel metal for condition B, etc.

The Harper Computer is an indispensable working tool for anyone concerned with selecting alloy fastenings to meet various corrosive conditions. Write for one, now.

Harper Bolts RESIST CORROSION

Harper manufactures and stocks a vast variety of bolts, nuts, and other fastenings in all of the commercial rust and corrosion resisting alloys . . . brass, silicon bronze, naval bronze, Monel metal, and Stainless steels. Here, you are almost sure to find exactly the fastening you need.

If you have a difficult corrosion problem—one not fully answered by the Harper Computer—submit it to the Harper engineers. These men are specialists in the manufacture and use of rust and corrosion resisting fastenings. They'll be glad to study your problem and suggest a solution. No obligation.

The H. M. HARPER COMPANY
2651 FLETCHER STREET
CHICAGO 18, ILLINOIS

Branch Offices—New York City, Philadelphia, St. Louis, Los Angeles, Milwaukee, Cincinnati, Dallas, Cleveland

HARPER *Chicago*

HARPER SPECIALIZES IN EVERLASTING FASTENINGS

Give Maintenance Costs the "Brush-off!"

Dusting unnecessary maintenance costs out of your plant picture is as easily done as said—and here's why: It's the time and labor involved—not the cleaning materials—which constitute by far the greater part of your sanitation costs.

And that's where, by utilizing a program of *planned* sanitation employing West products, you can just about cut maintenance man-hours and resulting costs to the bone. Longer-lasting . . . easier to apply . . . designed to do the best possible job in the least possible time, West maintenance products are economical and beneficial in still other ways.

By helping to insure employees' health, safety and morale, they give *added* protection to your workers, thereby reducing frequent absenteeism and high turnover.

For the answer to "greater profits through cleanliness," why not consult one of the 500 West trained representatives from Coast-to-Coast.

WEST Company

Products That Promote Sanitation

42-16 WEST STREET, LONG ISLAND CITY 1, N. Y.

★ BRANCHES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

CLEANSING DISINFECTANTS • INSECTICIDES • KOTEX VENDING MACHINES
PAPER TOWELS • AUTOMATIC DEODORIZING APPLIANCES • LIQUID SOAPS

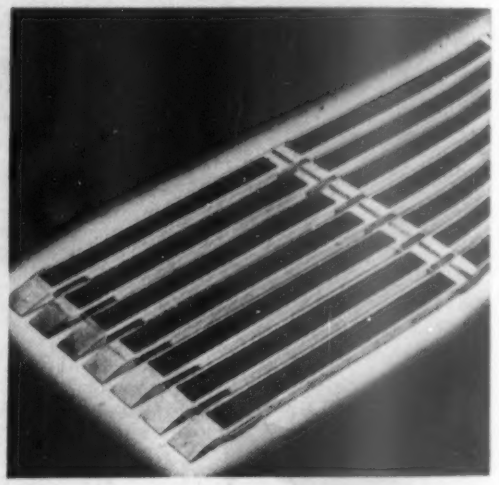
pieces, or parts of various sizes. The steel legs provide adequate height to permit accessibility from all four sides. Rack is finished in enamel. Palmer-Shile Co., 16007 Fullerton Ave., Detroit 27.

PIPE FITTING MACHINE

Red-E-Haul portable power pipe threading machine can be used to cut, chamfer, ream, and thread any pipe from ½ to 2 inches without changing dies. The range can be extended to pipe from ⅛ to 12 inches, with use of auxiliary equipment. The flip of a lever selects the size, and the job can be completed in seconds, even by an unskilled operator, according to the manufacturer. The machine has a built-in tool tray and dope cup. The switch for the 1-hp. motor incorporates a double electric outlet for lights and small power tools. Safety features include chuck, wrench ejector, electric overload protection, and automatic power pump coolant system. Any length thread may be cut. American Die & Tool Co., 558 Second St., Reading, Pa.

SAFETY MAT

Link wood-block type mat has a non-skid mineral surface, said to be unaffected by oil, grease, gasoline, water, and



most acids and alkalis. Has application where uncovered floors cause worker fatigue, and where chemicals, water, or oil products create a safety problem. The mat is constructed of seasoned hardwood cleats 2½ inches wide, linked with cadmium-plated wire and plates. The "Safety-Walk" surface is applied in strips to the wood cleats with a permanent adhesive, but can be replaced. Standard size mats are 2x6 feet, and fold to 27 inches x 2 feet x 2½ inches. National Mat Co., Inc., 106 Kingsley St., Buffalo, N. Y.

WELDING AND GRINDING GOGGLES

Line of safety goggles includes two types, one for welding, cutting, and brazing, and one for chipping and grinding. The welding goggles take 50-mm. lenses, shades No. 3 through 6, protected by cover glasses. Eyecups are of molded plastic, with ventilating screens and baffle plates on the outside. Type W-50 has plastic headrest and telescopic arms with concealed springs. Does not inter-

Always Busy!

MICHIGAN

SAVES HOURS EVERY DAY

for

PISTON AND PIN MANUFACTURER

Before this nationally-known automotive parts manufacturer put a fully convertible MICHIGAN TLDT-20 CRANE on the job, handling of limestone, sand, coke, and scrap was consuming too much time — costs were running too high.

Now that these operations, and more too, are done with this MICHIGAN, things run smoothly on schedule and these handling costs are 'way down. As this satisfied owner said, the longer you own a MICHIGAN, the more you'll find to keep it always busy saving time and cutting costs.

Get the Facts

about the complete line of

MICHIGAN Mobile Cranes

6 to 12 ton capacities

Easily convertible to clamshell, magnet crane, dragline.

MICHIGAN

MICHIGAN POWER SHOVEL COMPANY

385 SECOND STREET • BENTON HARBOR, MICHIGAN, U.S.A.

Get the benefits of
MOTOR-GENERATOR
BATTERY-CHARGING
for your
MOTORIZED LIFT-TRUCKS

HERTNER
TYPE "H"
MULTIPLE BATTERY
CHARGER

FULLY AUTOMATIC!

The Hertner Type "H" Motor-Generator Charger charges two or more batteries by completely automatic controls without removing the batteries from trucks.

Fully Charge Lead-Acid Batteries in 8 Hours—
Nickel-Alkaline Batteries in 7 Hours

Two and four circuit Type "H" chargers are self-contained units with motor-generator sets mounted inside control cabinet. Individual ammeters record charging rate of individual circuits.

Desk top height of instrument panel makes readings of charging rates available at a glance. Screened covers at sides and back provide air circulation for cool operation. Each charger is provided with charging cable—nothing else to buy, since unit is *complete.*

Mail coupon for Bulletin 102 which gives full details of Hertner Type "H" Multiple circuit chargers.

The* HERTNER *Electric Co.
A General Precision Equipment Corporation Subsidiary
Motors • Motor-Generators • Generator Sets
Cleveland 11, Ohio
Representatives in principal cities

THE HERTNER ELECTRIC COMPANY
12750 Elmwood Ave., Cleveland 11, O.
Send copy of Bulletin 102 to:
Name_____
Address_____
City_____ State_____

fere with prescription glasses, and may be raised and lowered with one hand. Type WR-50 has elastic headband. The grinding goggles are similar, but have clear, hardened lenses, ventilating

screens against flying particles, and no baffle plates. Type G-50 has plastic headrest, and Type GR-50 has elastic headband. Jackson Products Co., Warren, Mich.

INTERCOMMUNICATOR

Suitable for small-plant requirements, electronic intercommunication system

is available in 1-, 2-, 3-, and 4-point hookup with substations, with or without call-back feature. Case is black plastic. Dictograph Prods., Inc., 580 Fifth Ave., New York 19.

PROJECTOR

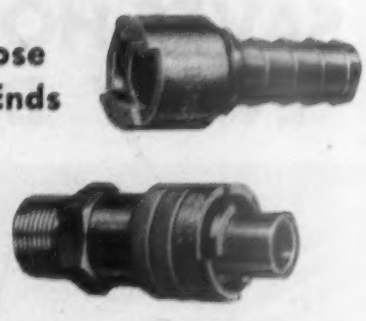
Type OA3 opaque projector, supplementing Model OA2 mentioned in May, 1946 FACTORY, features enlarged copy holder that takes 7½x10 inch material. In addition to book pages, such objects as slide rules, micrometers, and gages can be projected by the machine. Charles Beseler Co., 243 East 23rd St., New York 10, New York.

DIFFUSION PUMP

Type H-16 all-metal, three-stage, oil diffusion pump has 8500-c.f.m. capacity at 0.1 microns. It works against fore-pressures as high as 250 microns, maker

DALLETT'S
Dalbo
Interchangeable
Couplings
and
Fittings

Hose Ends



Pipe Ends

"DALBO" Couplings and Fittings are expertly machined from solid bar stock. They are rust proof and completely tight under any pressure from 10 pounds upward. The "Dalbo" locking sleeve prevents accidental uncoupling.

Interchangeable

"DALBO" Fittings are interchangeable with similar types, they are quick-fitting, dependable, pressure proof and have the DALLETT Safety Features.

Write for Bulletin FM-300

—Quality Tools since 1883—

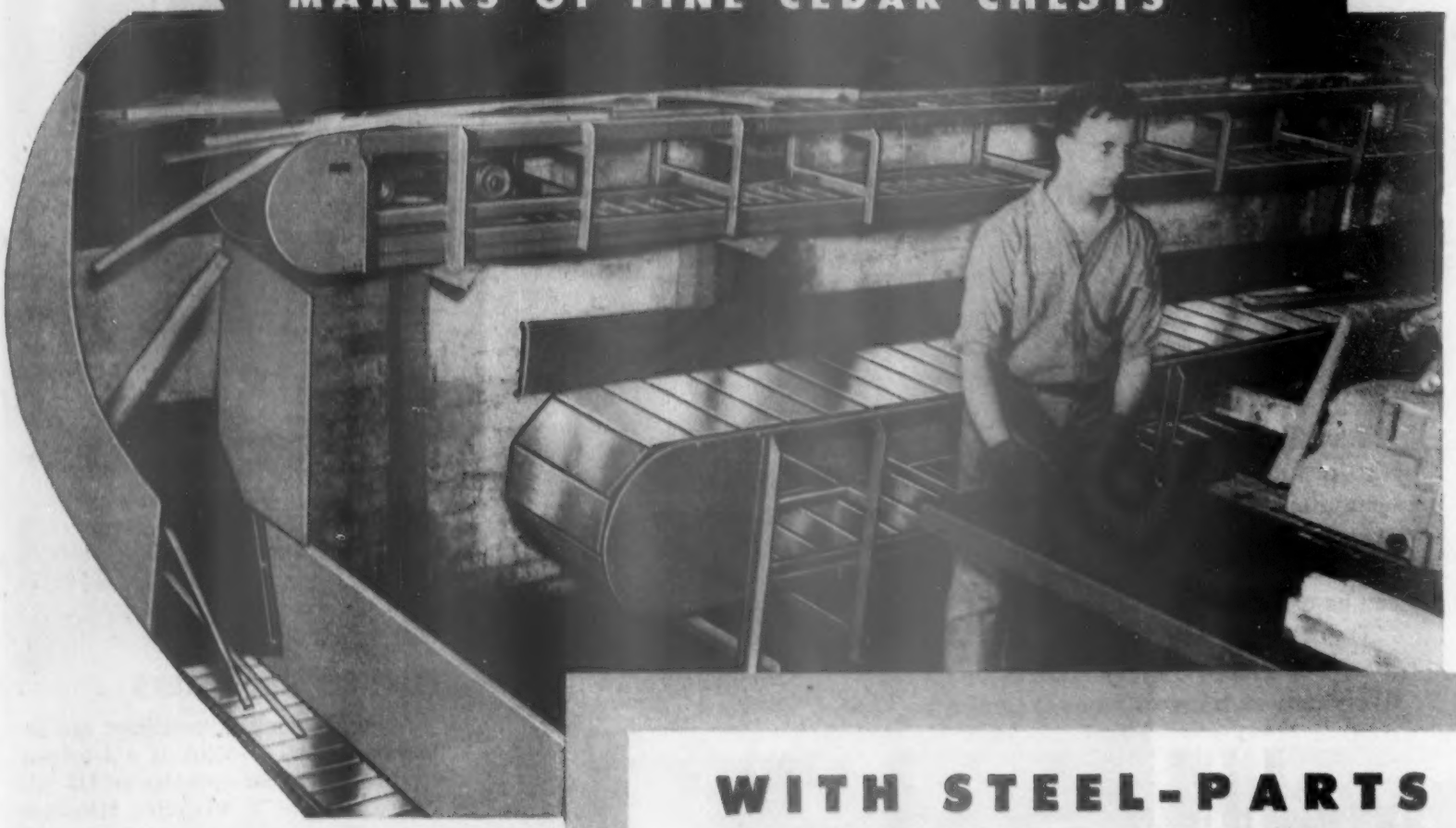
THE DALLETT COMPANY
Mascher at Lippincott St., Philadelphia 33, Pa.
Manufacturers of Pneumatic Tools and Accessories
Distributors
in Principal Cities throughout the United States, Canada, Europe, and South America

PRODUCTION UP 30% . . .

OPERATING SPACE CUT 58%

AT ED ROOS COMPANY

MAKERS OF FINE CEDAR CHESTS



Here's What Steel Belt Conveyors did at the Ed Roos Company

1. Production efficiency UP 30%.
2. Unit cost DOWN 10%.
3. Waste REDUCED by 5%.
4. Machine capacities INCREASED 65 to 95%.
5. Operating space CUT by 58%.
6. Worker efficiency RAISED — fatigue LESSENED.
7. . . . AND THE ORIGINAL INVESTMENT ON THE EQUIPMENT WAS RETURNED IN SAVINGS IN LESS THAN 60 DAYS!

WITH STEEL-PARTS STEEL BELT CONVEYORS

Here's added proof that conveyorized handling pays out — especially when the machines chosen for the job are rugged, versatile, easy-to-maintain Steel-Parts STEEL BELT Conveyors. Pre-engineered Steel-Parts Conveyors are easy to install, too. Mr. W. H. Ziegler, Factory Superintendent at the Ed Roos Co., reports that production increased DURING the period of change over to conveyorized handling. Let Steel-Parts engineers make specific recommendations concerning YOUR materials handling problems. Mail the attached coupon today.

MAIL THIS COUPON TODAY

STEEL-PARTS MFG. CO.
Division of Blackstone Manufacturing Company
220 South Morgan Street, Chicago, Ill.

☐ Please send me complete information including engineering data and specifications on your Steel-Belt Conveyors.

☐ Please have your representative call to discuss our specific materials handling problems.

NAME_____ POSITION_____

FIRM_____ ADDRESS_____

CITY_____ STATE_____

STEEL-PARTS
MANUFACTURING CO.
DIVISION OF BLACKSTONE MANUFACTURING COMPANY

Corrosion is no problem when you use

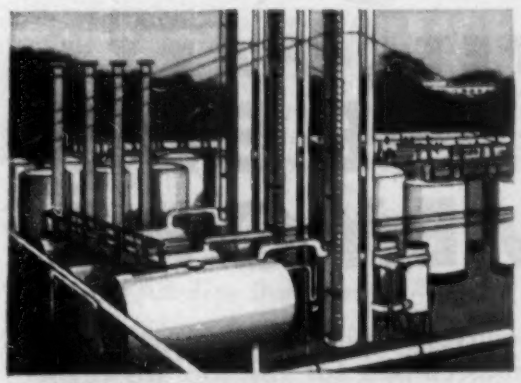
UCILON

Many users tell us UCILON 400 resists *more* corrosives for *longer* periods than any other coating they've ever tried!

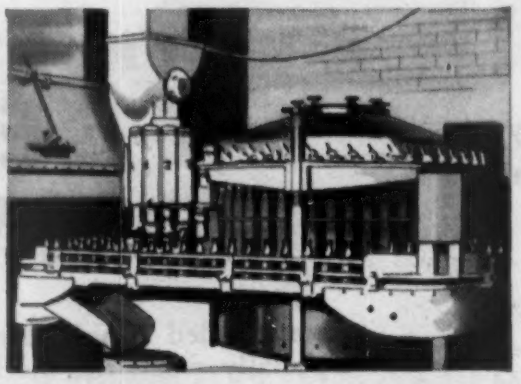
HERE, AT LAST, is a coating that really stops corrosion even where conditions are severest!

It's Ucilon *400*, a plastic base coating in the Ucilon group (which also includes aluminum and baking synthetic coatings). The inert synthetic resins in Ucilon 400 form a tough coating that resists both acids and alkalies, oil, water, alcohol and many solutions and fumes. It has excellent adherence, flexibility, no taste or odor when dry—and can be used on concrete, metal or wood.

Don't put up with half measures in your plant. Put Ucilon protective coatings to work on your own toughest job—and watch how effectively they stop corrosion-losses and cut costs.



A LARGE CHEMICAL PROCESS PLANT always had trouble protecting the exterior of pipelines which were exposed to caustic-fume-laden atmosphere. They ended their troubles with Ucilon 400. It's now 22 months since it was applied—and it's still going strong. No former coating had lasted even 6 months!



BOTTLING PLANTS all over the country are turning to Ucilon 400. In one plant, painting of bottling machines was considered to be almost useless—the job never lasted. Ucilon was tried. They now report that nothing ever used before even approaches the *2 years* Ucilon has been withstanding the high humidity and spillage!

SEND FOR THIS BULLETIN

It gives you more details on properties, types of coatings, application data. Write your nearest United Chromium office.

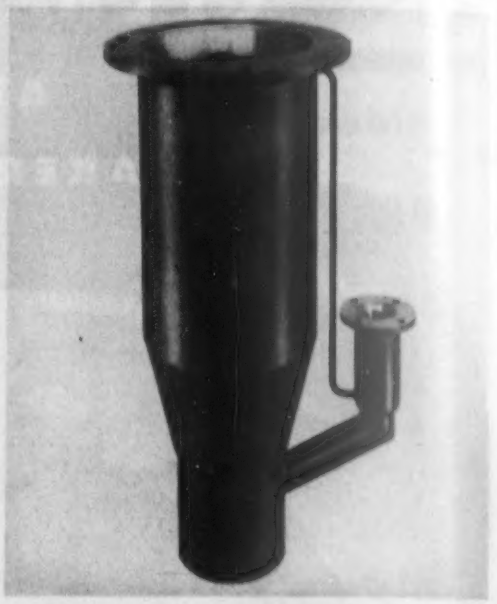
UCILON* Protective Coatings

UNICHROME products of UNITED CHROMIUM, INCORPORATED

*Trade-Mark Reg. U. S. Pat. Off.

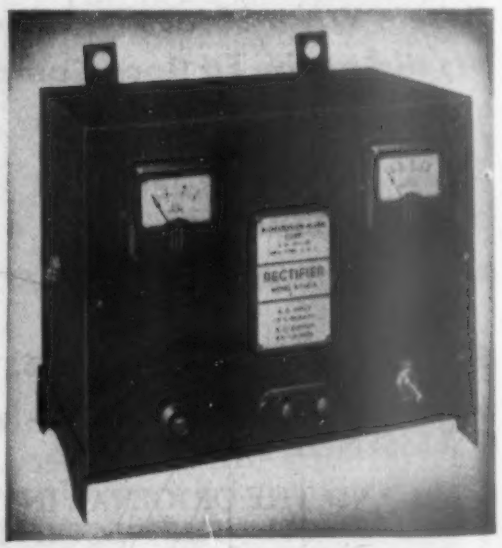
51 E. 42nd St., New York 17, N.Y. • Detroit, Mich. • Waterbury, Conn. • Chicago, Ill. • Dayton, Ohio • Los Angeles, Cal.

states, eliminating need for a booster in many applications. Inlet diameter is 16 inches, and overall height 56. Blankoff occurs at 0.001 micron. Jets are spun aluminum; all other parts of the pump that are exposed to vacuum are stainless steel, to minimize corrosion and outgassing. The externally mounted heaters are replaceable. Heat input is 2250 watts. The pump is suitable for large coating operations, large vacuum furnaces, or other industrial applications. National Research Corporation, Cambridge 42, Mass.



SELENIUM RECTIFIERS

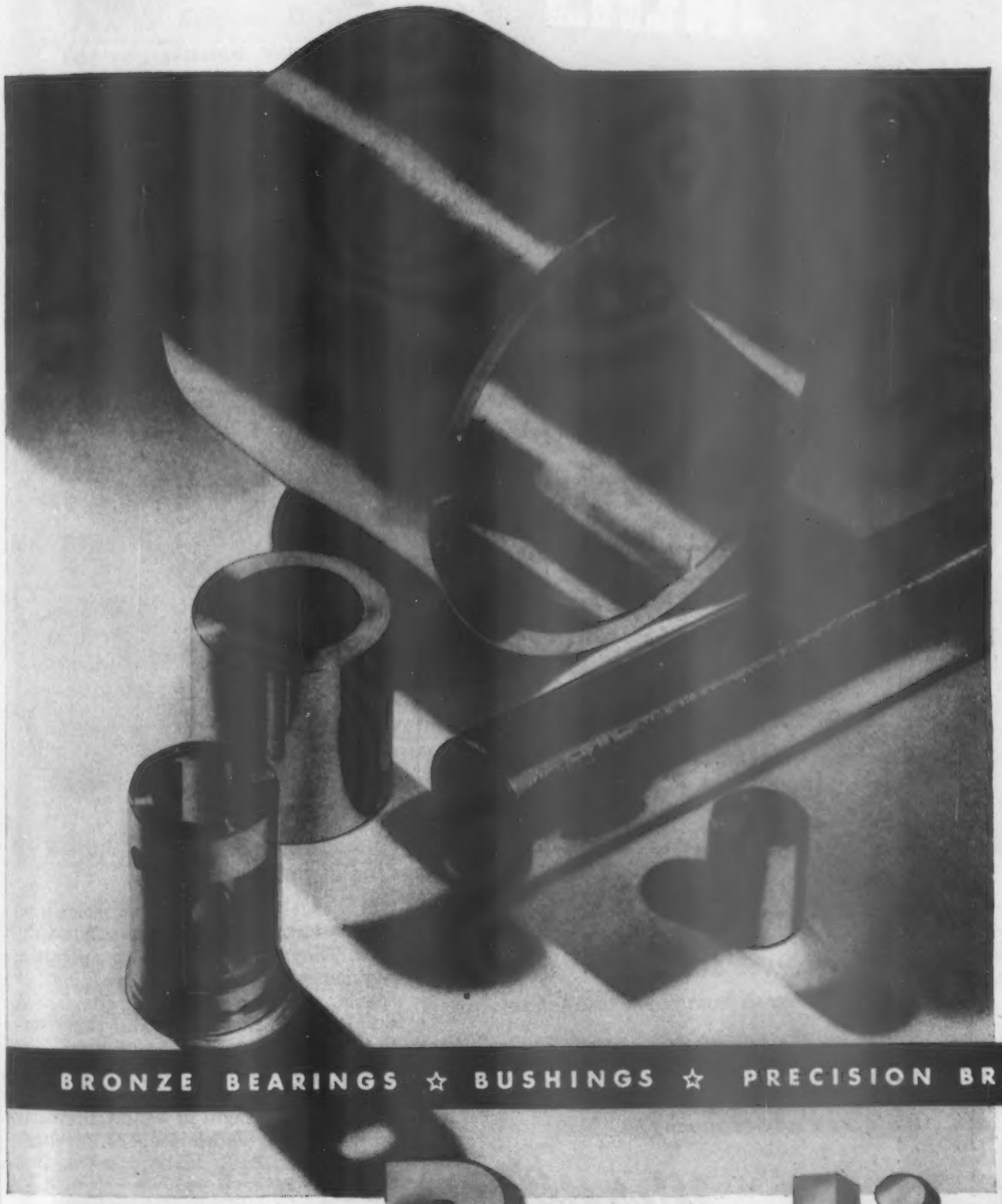
Two small selenium rectifiers are announced. Model D-513A is a 4-ampere, 6-volt rectifier that operates on 115 volts a.c., single phase, 50/60 cycles. Measuring 7.5x4.5x5 inches, it is designed for bench or wall attachment. Model D-514A, a 10-ampere, 8-volt rectifier, 8x10x6 inches, includes a voltmeter and ammeter. Richardson-Allen Corp., 15 West 20th St., New York.



HYDRAULIC RAM

Triple sleeve ram that pumps in any direction supplies controlled hydraulic force for pushing, direct pulling, lifting, clamping, bending, pressing, and assem-

The Bunting Stock-Carrying Distributor has Bunting Bars and Bearings in adequate quantity and variety, in your community. Backed by Bunting Branch and Factory stocks, he has the Bronze you want—now. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.



BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

Bunting

55

HEIN-WERNER HYDRAULIC JACKS

THE SUPERIOR INDUSTRIAL JACK

LARGE SOLID STEEL BASE gives firm, solid footing, prevents tilting under load.

PRESSURE TESTED malleable iron used in top nut and in handle sockets afford extra strength at points of greatest strain.

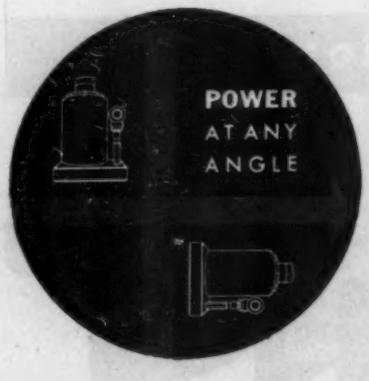
HEINITE PISTON is an exclusive H-W achievement. It withstands ten times the wear of conventional cups or packing.

CANNOT LOWER ACCIDENTALLY as handle must be removed from pump to open release valve.

ALL H-W MODELS are factory-tested at 1½ times their rated capacity.

If you like to figure out short cuts, devise easier ways of doing things, or develop "special equipment" which will enable a factory to turn out better work in less time, you'll find many applications for H-W Hydraulic Jacks. They're great for many different moving, bending, pressing, pushing or lifting operations.

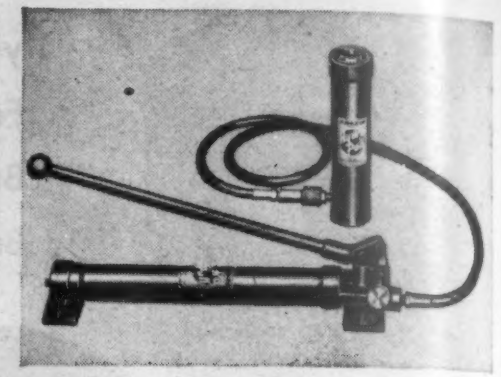
Made in models of 1½, 3, 5, 8, 12, 20, 30, 50 and 100 tons capacity. Consult your nearest industrial supply distributor or write us for details.



Hein-Werner HYDRAULIC JACKS

HEIN-WERNER CORPORATION • WAUKESHA, WIS.

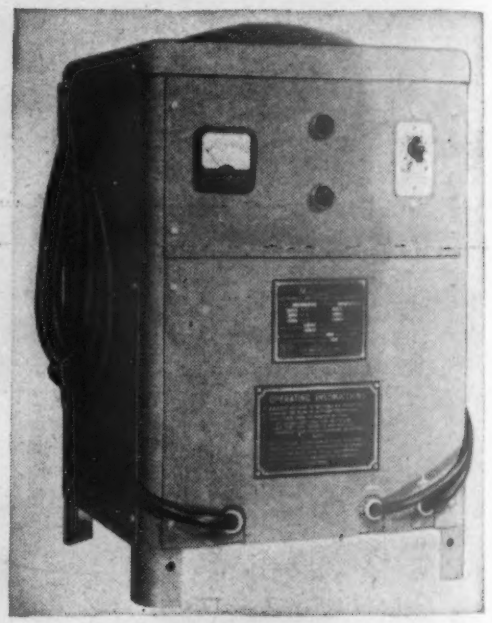
bly jobs. The triple sleeve design provides positive control of the ram, as well as a fluid seal. Hand-operated, all controls are on the pump. Flexible hose connects the pump with the ram, transmitting oil under high pressure. Called Hydra-Pull, the ram is 11 inches high,



has 6-in. lift, and 10-ton capacity. Also may be obtained in 3- and 6-in. sizes. Attachments are available. Sunset Equipment Distrs., 5838 Woodlawn Ave., Los Angeles.

TRUCK BATTERY CHARGERS

Line of rectifier chargers includes three models for electric hand trucks, and three for operator-ridden trucks. Known as Rectotruck Chargers, the six types



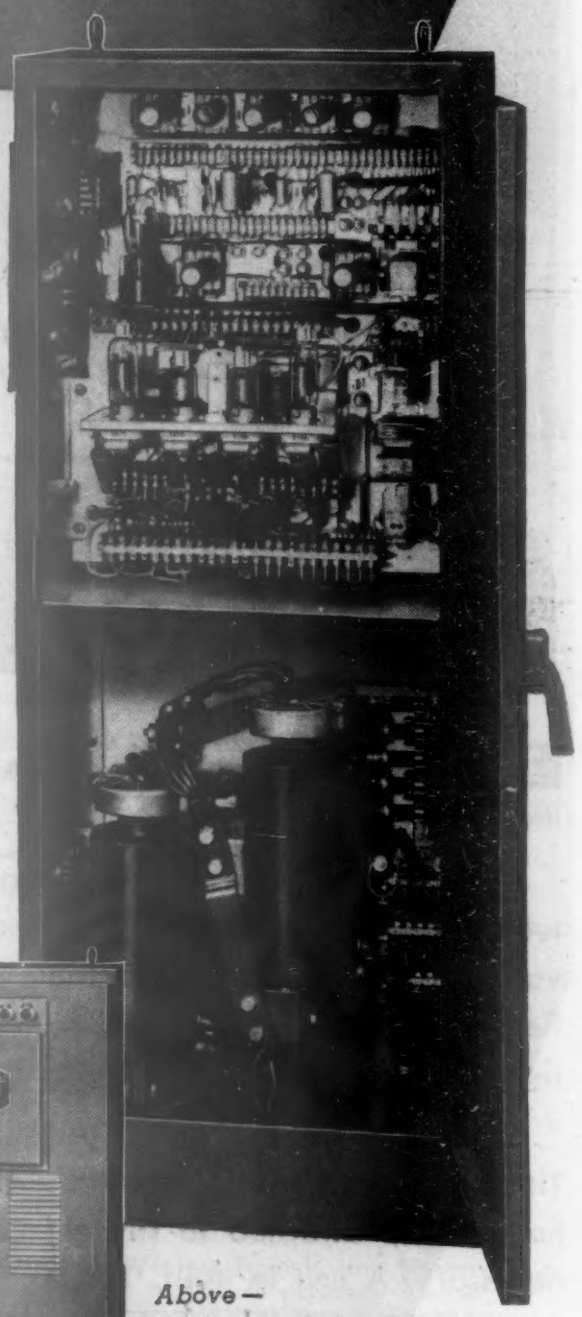
will charge lead or Edison batteries from either of two standard power line voltages. They are automatic in operation, requiring no hydrometer readings or special settings for lead batteries. A simple test fork reading and timer setting is recommended for Edison batteries. The chargers use magnesium-copper sulfide rectifiers, and Exide TVR voltage relays. Light in weight, they may be located anywhere in operating range of the truck. P. R. Mallory & Co., Inc., Indianapolis.

ANTISEPTIC OINTMENT

Claimed to eliminate sting, unpleasant odor, and hard-to-remove stains, a first aid antiseptic ointment treats minor wounds, cuts, abrasions, and surface burns. Maker states it also prevents

NOW Electronic WELDER CONTROL designed to INDUSTRIAL STANDARDS

NEW Square D Class 8993 combination controllers for resistance welders *incorporate, in one enclosure, electronic contactor, heat control, synchronous-precision weld timer, and sequence panel. They provide accurate time and current measure recommended for welding non-ferrous metals, stainless steels, small parts and other critical jobs.*



IMPORTANT NEW CONSTRUCTION FEATURES

- All terminal connections and tie points are made accessible by opening main door and swinging out weld time panel.
- Simple tools—screw-driver and pliers—can be used to replace components. Number of soldered connections is minimized.
- Functional sub-panels (contactor, heat control, timing, and sequencing) have separable connectors—may be quickly removed or replaced.
- Designed for mounting on side of machine or for wall mounting.

IMPORTANT NEW CIRCUIT FEATURES

- New separate excitation circuit for ignitrons makes firing independent of voltage or load current. Firing pulses have consistent amplitude and duration for all heat control settings from 20% to 100% current.
- Synchronous-precision weld timing circuit operates on new differential discharge principle. Voltage changes before or during the weld have no effect on timing accuracy.
- All-electronic circuit has no sequencing relays and is of simplified design. For maximum safety, air valve is energized by a magnetic contactor. A no-weld relay disconnects firing tube anodes only in response to no-weld and water-flow switches, and warm-up timer.
- Coupling transformers isolate functional sections of circuit for maximum safety and efficiency. Initiating, no-weld, and pressure switch circuits are 110 volts.

Above—
All circuit terminals and tie points accessible by opening main door and swinging out sequence panel.

Left—
Controller can be arranged either for side of machine mounting or wall mounting.

Write **for Bulletin 208 • Square D Company • 4041 N. Richards St. • Milwaukee 12, Wisconsin**

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D CANADA, LTD., TORONTO, ONTARIO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

Progress in design is *yours*

Titeflex is keeping pace with the latest designs of machinery and industrial equipment.

TITEFLEX is constantly developing new types of all-metal flexible tubing. Tubing fabricated from brass, monel, stainless steel, and various other metals are available for any application demanding flexibility, high temperature, high pressure, corrosive resistance, tightness, vibration, or downright abuse.

Difficult plumbing and pipe installations are eliminated when Titeflex is specified for the job. Elbows, bends, and fittings that have to be attached to straight lengths of tubing are no longer necessary. A unit in itself, Titeflex is easily installed. A few quick turns on a wrench and the most complicated installation job is accomplished in a few minutes.

Titeflex has a proven record of performance for more than 30 years. Problems of any type installation are invited without obligation.

Titeflex, Inc. 505 Frelinghuysen Ave., Newark 5, N. J.

Exclusive Manufacturers of Titeflex high quality products for more than 30 years

Sales Offices { CHICAGO CLEVELAND DETROIT PHILADELPHIA LOS ANGELES BOSTON SAN FRANCISCO TORONTO

dressing from sticking to the skin. It is applied as a light film over the affected area without rubbing in. The base is miscible with tissue exudate, and the medicinal agent is not released until moisture from the skin acts on the ointment. This is said to prevent overdosage. Supplied in a jar. Vodine Co., 407 South Dearborn St., Chicago 5.

CURRENT TRANSFORMER

Designed for relay and meter work, Type CT-2.5 current transformer has Class 0.3 accuracy with B-0.1, B-0.2, and B-0.5 burdens. Impulse strength is 45 kv. as added protection against lightning and switching surges. Available for indoor use in the 2.5 kv. class of insulation for operation on circuits of 2890/5000 volts or less, the transformer is rated from 10 to 800 amperes, with a full-load secondary current of 5 amperes in all sizes. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30.

PRESSURE CLEANING MACHINE

Hydra-Blast, an electrically heated automatic pressure cleaning machine, is lightweight and portable. Said to eliminate fumes, fire hazards, and expensive

exhaust systems, it features fingertip control of water, pressure, and chemical. Visible indicator shows amount of chemical in tank. Pilot light indicates when current is on, and a "safety eye" provides automatic current shut-off if water fails. Maker states the machine blasts 50 gallons of chemically-treated hot water per hour on a minimum pressure of 150 pounds, removing dirt, grease, and grime. Cleans motors, trucks, tractors, and other machinery. Has no moving parts. Reynolds Industries Corp., 57 South 6th Ave., Mt. Vernon, N. Y.

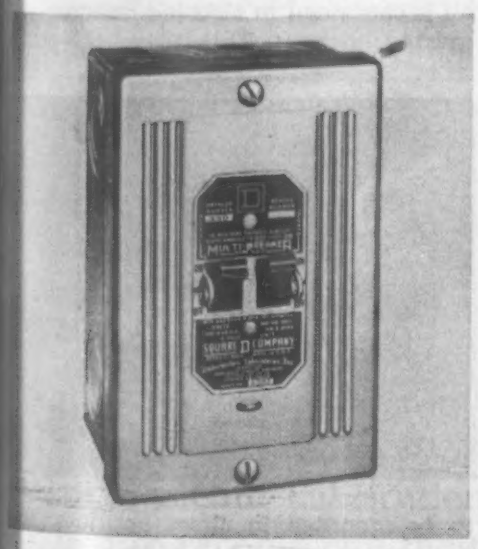
BOOK TRUCK

Heavy-gage steel book truck is designed for use where the rapid drying or curing of sheets of rubber or plastics, or other products, is essential. The welded

all-steel shelves, reinforced to withstand rough usage, provide additional rigidity. Long, sturdy extension springs facilitate raising and lowering individual shelves. When raised, shelves are automatically held up in tilted position. Equipped with metal or rubber-tired wheels or casters, the truck can be built with legs or skids to accommodate power lift or hand-operated trucks. Palmer-Shile Co., 16007 Fullerton Ave., Detroit.

CIRCUIT BREAKER

Type MO-2 Multi-breaker is a 1- and 2-pole unit suited for lighting appliances and small motor circuits. It incorporates a thermal- (coilless) magnetic trip that provides instant tripping on short circuits, but holds on harmless overloads, functioning in 1/50 to 1/100 of a second. The magnetic trip is combined with a thermal bi-metal element for time-delayed tripping on moderate



overloads. The circuit breakers are furnished in 1947 N.E.C. ratings of 15, 20, and 30 amperes — 120/240 volts, a.c., in flush or surface types. Square D Co., Switch & Panel Div., 6060 Rivard St., Detroit 11.

WELDER CONTROLS

Non-synchronous controls are designed for foot-, air-, motor-, and hydraulically-operated spot, projection, butt, and seam resistance welders. Enclosed in a

"KEX" Industrial Wiping TOWELS

Fill the Bill...More Economically!

Many of the country's leading industrial companies use KEX Industrial Wiping Towel Service. And here's why—

1. They *can't afford* to use scrap rags that often mar expensive and sensitive machinery surfaces because of overlooked buttons and hidden grit, hard seams and harsh fabric.

2. They like the uniform sizes and soft feel of KEX Industrial Wiping Towels.

3. They like the way they are delivered chemically cleaned—in business-like bundles—in quantities, and on schedule, as needed, on a rental basis.

4. They know that KEX Industrial Towels are woven specifically for wiping jobs, with bound edges to eliminate fraying and catching in machines.

Take a tip from these big companies . . . Where efficient, time-saving operations make important items of such often overlooked expenses as wiping costs.

Rent KEX Industrial Wiping Towels and figure your savings! Nothing to buy—no expensive inventory—just a low monthly rental. The first month you use this service should show a decided saving on wiping costs.

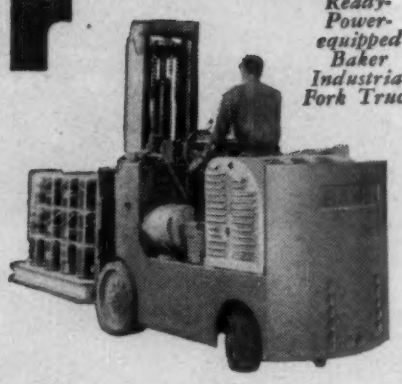
For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX National Service, 295 Fifth Avenue, New York 16, New York.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

"KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

READY-POWER means constant power



Ready-Power-equipped Baker Industrial Fork Truck

FOR ELECTRIC TRUCK OPERATION AT ITS BEST

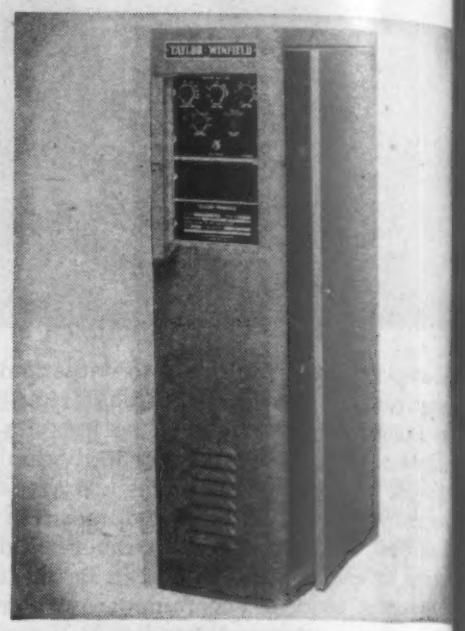
The *maximum performance* of any electric truck can be maintained *indefinitely* when it is equipped with Ready-Power. These complete, compact power units provide constant, dependable power generated right on the truck chassis. Any electric truck can be converted to Ready-Power. Manufacturers will equip trucks with Ready-Power at your request.

Ready-Power-equipped Elwell-Parker stacking merchandise

THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

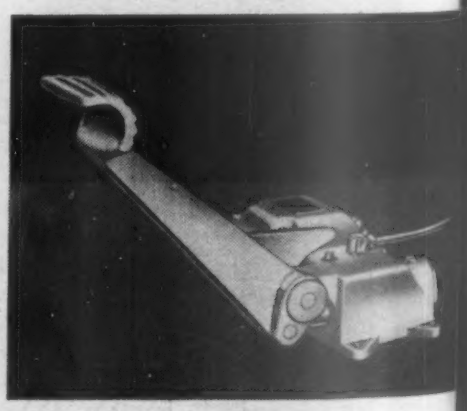
ventilated dust-free cabinet, they can b installed on the welder or placed at distance, by connecting power and wate lines. Available for operation on single phase a.c. and control voltages 110, 20 220, 380, 440, and 550 volts; power sup ply voltage 208, 220, 380, 440, and 55 volts. Unit has no projecting knobs o handles; has safe dead-front panels drip-proof ventilating louvers; an nameplates with reference data. D.



timing circuits operate on regulated bias and timing voltages to compensate for variations in power supply voltage. The Taylor-Winfield Corp., Warren, Ohio.

HYDRAULIC FOOT PUMP

Working pressures up to 1500 p.s.i. ca be obtained with a 13¼-lb. hydraulic foot pump. The pedal return spring is built in the pump body, and the release is controlled by raising pedal slightly. Has 15-cu.-in. usable oil capacity. The oil is contained in a sealed reservoir re quiring no vent. This allows the pump



to be mounted in offset positions. The flat base has three bolt holes for mount ing. Features include built-in oil strain er, adjustable relief valve, and chrome plated piston. Lyon-Raymond Corp., 3827 Madison St., Greene, N. Y.

SOLDER FEEDER

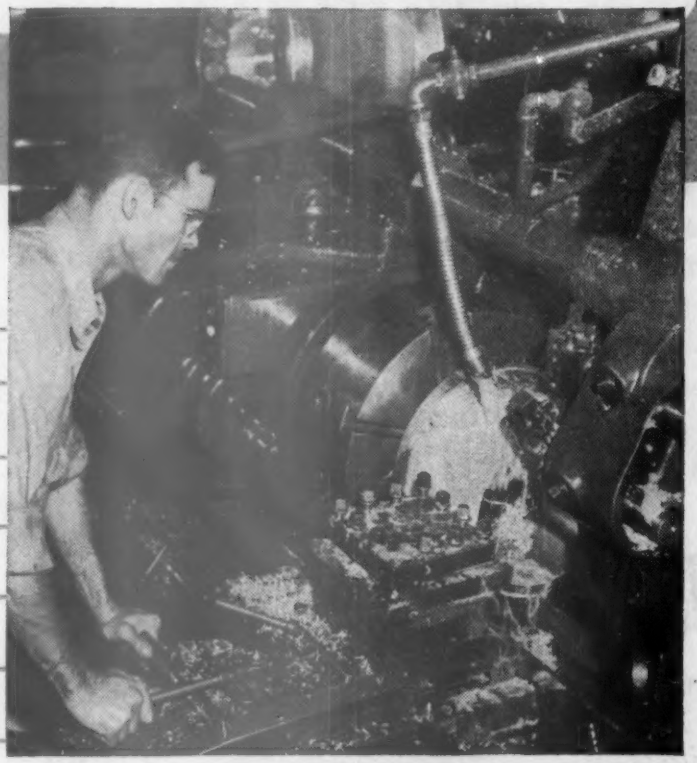
Clamping on any standard electri soldering iron, Solder-Matic feeds solde at fingertip pressure. It frees one han to manipulate parts or tools, make

Properties that *Count* in a soluble oil ✳

You get them all in

GULF SOLUBLE CUTTING OIL ✳

- ✳ Helps keep cutting tools sharp, grinding wheels clean
- ✳ Highly stable — in use or in storage
- ✳ Helps prevent gummy deposits
- ✳ Helps prevent rust
- ✳ Emulsifies readily with all but the hardest water
- ✳ Clean, pleasant odor — ready operator acceptance
- ✳ Nonfoaming



Facing and turning operation on steel forging, typical of the diversified machining jobs where Gulf Soluble Cutting Oil helps improve production and increase tool life.

THESE properties are combined in Gulf Soluble Cutting Oil to help you get greater production efficiency over a wide range of cutting, milling and grinding operations.

Call in a Gulf Lubrication Engineer and ask him to recommend the proper concentrations of Gulf Soluble Cutting Oil for your particular requirements. For further information on Gulf Soluble Cutting Oil—and for one of Gulf's practical slide-rule-type calculators, which will help you maintain desired soluble oil concentrations—send the coupon at right.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston • New York • Philadelphia • Pittsburgh • Atlanta
New Orleans • Houston • Louisville • Toledo

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company FM&M
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, the material I have indicated below:

- ☐ Further information on the new Gulf Soluble Cutting Oil.
- ☐ Practical slide-rule-type calculator for help in maintaining desired soluble oil concentrations.

Name.....

Company.....

Title.....

Address.....

TAKE ADVANTAGE
of the
COMPLETE INVENTORY
of LEATHER BELTING
maintained by your

GRATON AND KNIGHT

DISTRIBUTOR

His stock and experience are yours to command . . . and he's no further away than your telephone.

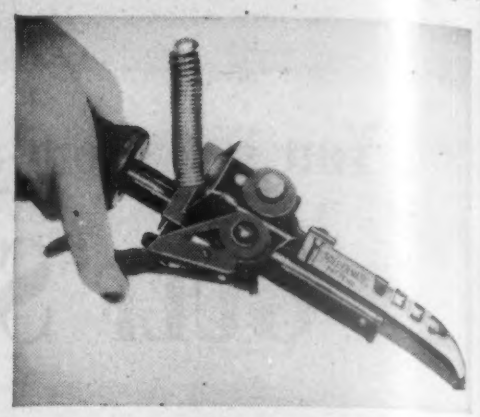
Look up your Graton & Knight distributor in THOMAS' REGISTER or your local telephone directory for prompt service.

GRATON & KNIGHT COMPANY

TANNERS, LEATHER BELTING — GRATON AND KNIGHT — INDUSTRIAL LEATHER PRODUCTS

330 FRANKLIN ST., WORCESTER 4, MASSACHUSETTS

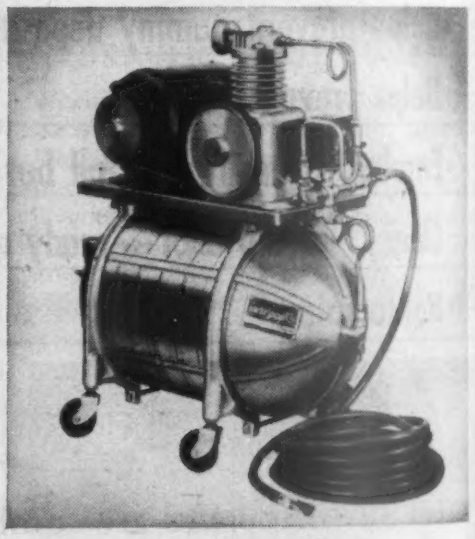
states, saves solder and time, and can operate in tight spots. Also said to eliminate molten solder drippage. Can handle solder in short lengths, in small coils, or fed from a spool up to 25 pounds. Takes solder from 1/16 to 3/16 inch in diameter, and feeds up to 3/16 inch per



stroke. Screw adjustment of the stainless steel nozzle guides the solder. Lightening holes cut weight, and cool the operation. Nelpin Mfg. Co., 45-17 Davis St., Long Island City 1, N. Y.

TANK COMPRESSOR

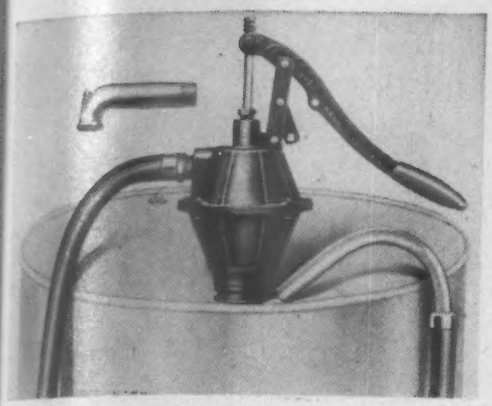
Compressed air for high pressure service is furnished by tank compressor Model 3150, which can be moved where needed. The ½-hp. piston type compressor, "cushion-mounted" on a 12-gal. stainless steel tank, is equipped with casters. Includes pressure gage, outlet drain, safety valve, hose, air chuck, and an automatic



starting and stopping switch. Maintains a constant air supply between 120 and 150 pounds. The unit is adapted to operate paint spraying equipment, to inflating truck and tractor tires, and to operating dusting machines, blow torches, and grease guns. When used for spray painting and finishing, an airline assembly with spraygun and quart container is furnished. The Electric Sprayit Co., Sheboygan, Wis.

DRUM PUMP

Utilizing the diaphragm principle, a hand pump removes alcohol, kerosene, gasoline, oils, paint thinners, water, or sprays, from drums and barrels. Pumping 15 gallons of light oil per minute, it requires no priming, and has no leather or rotating parts to wear out. Pump screws directly into a 15- to 60-gal.



capacity drum. No separate bung bushings are required for 1½- or 2-in. drum openings. A lift of the handle allows liquid to drain into drum, and an automatic seal prevents evaporation. Includes an 8-ft. grease hose with static wire, nozzle, and fitting, and a special suction pipe for drums or barrels having a ¾-in. opening. General Scientific Equipment Co., 27th & Huntington Sts., Philadelphia 32.

A.C. WELDERS

Dial-lectric control in line of a.c. are welders eliminates need for moving coils or cores, worm gears, sprockets, and chain or lever adjustments. The welder has no moving parts. Current selection is made by turning a single dial. No auxiliary current boosters are needed. Removable dial permits remote control, providing a current amperage adjustment at the job for manual or automatic welding. Control dial covers two separate ranges, a high for general-purpose welding, and another for light-gage welding. Models range from intermittent indus-

trial to heavy-duty units up to 625 amperes. Harnischfeger Corp., Welding Div., 4400 West National Ave., Milwaukee 14.

ELECTRIC HOIST

Built for use where a stiff arm is needed for manual spotting to close tolerances, electric cable hoist is furnished in 500-, 750-, 1000-, and 1500-lb. capacities. Different lifting speeds and heights are available, and the equipment requires 15¼-inch headroom. The stiff arm can be used laterally to push a bridge-beam

MORE PULLEYS ARE TURNED BY

GRATON AND KNIGHT

LEATHER BELTING

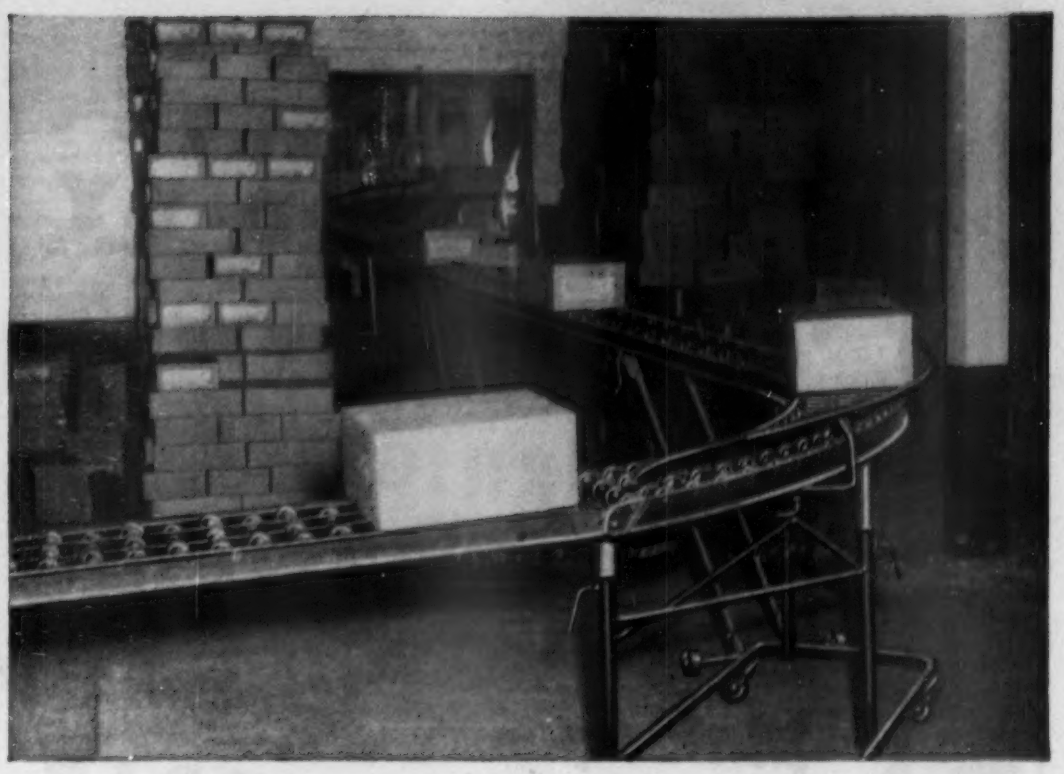
than by any other make

YOU CAN DEPEND on quality control by the world's largest leather belting manufacturer to give you high transmission efficiency, peak production and maximum service life in leather belting.

GRATON & KNIGHT COMPANY

TANNERS, LEATHER BELTING — GRATON AND KNIGHT — INDUSTRIAL LEATHER PRODUCTS

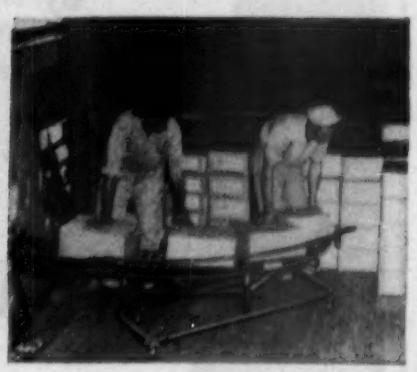
330 FRANKLIN ST., WORCESTER 4, MASSACHUSETTS



Cut Labor Costs

WITH

RAPIDS-STANDARD CONVEYORS



Fast, efficient handling of the cases and empty jars from the time they enter the plant, throughout filling, storage and loading is accomplished at Cinderella Foods, Inc., Dawson, Ga., through the use of a Rapids-Standard Conveyor System.

In the words of Mr. C. M. Cruikshank, Executive Vice-President: "The savings in labor for us is tremendous. I estimate that your gravity track and boosters are saving us from $200 to $250 each week. We just couldn't do without them and if no more were available, we wouldn't sell them for five times what they cost."

The Rapid-Wheel Gravity Conveyor and The Stevedore, Jr. (Power Belt) Booster make a handling team in this plant that eliminates all strenuous lifting and hand moving. Cartons placed on the conveyor at the loading dock move on to their destination without rehandling. Stevedore, Jr. does the heavy lifting work and Rapid-Wheel Conveyor carries the cases through the plant by cost-free gravity. Cases move in a minimum of space all the way and traffic problems are non-existent. Both Stevedore, Jr. and Rapid-Wheel Conveyors are easily portable and can be quickly set up in any part of the plant or warehouse.

Check into the advantages of this cost reducing equipment today. What it has done for hundreds of others it can also do for you. It COSTS NOTHING TO GET FULL PARTICULARS. WRITE TODAY FOR FREE LITERATURE.

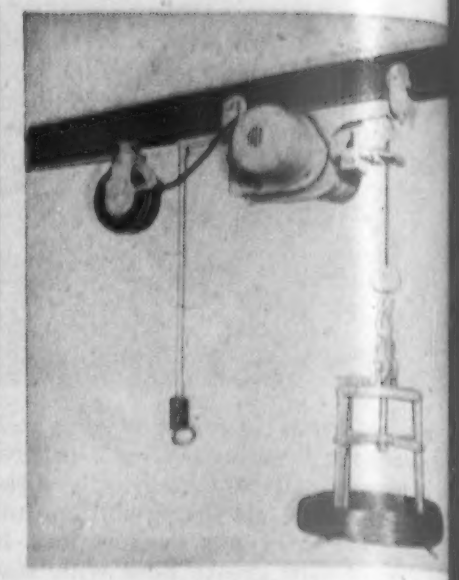
OFFICES IN PRINCIPAL CITIES

Manufacturers of

STEEL FORGED CASTERS · TRUCKS · CONVEYORS · POWER BOOSTERS

The Rapids-Standard Co., Inc.

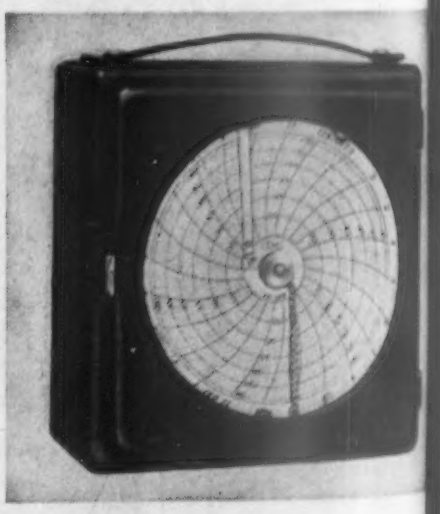
Sales Division—370 Peoples National Bank Bldg., Grand Rapids 2, Mich.



or jib on which the hoist may mounted, as well as to push the h itself in the transverse direction. Ho ing and lowering is by pushbutton co trol from the end of the arm. Li switches restrict hoisting and lowe in desired ranges. Unit incorporate self-actuating motor brake, a self-co ing main load brake, and swinging id sheave. The Yale & Towne Mfg. C 4530 Tacony St., Philadelphia 24.

TEMPERATURE RECORDER

Portable temperature recorder, said resist shock and vibration, is suitable use in trucks in transit, as well as checking refrigerating, heating, and conditioning equipment. Available two forms: the single-pen unit for cording temperature only, and the tw pen temperature and time-operation



corder. Simple in design and const tion, it has a transparent, unbreak plastic front, which permits full vie chart and pen arm. Furnished in mo to operate in different ranges. C drive is a 7-day spring-propel mechanism with charts of 24- or hour duration. Recorder is enclose aluminum case with enamel finish. Tagliabue Mfg. Co., Park & Nost Aves., Brooklyn 5, N. Y.

PACKAGE TRUCK

Departmental package truck, Mode 811, has a 16x22-in. platform, 2 in from the floor. Equipped with needle bearing wheels; the front w

PRODUCTIVE LIGHTING IS *Controlled* BY EACH USER ...FOR EACH OCCASION

Trained eyes and hands have an ally in the Dazor *Floating* Lamp, whether they're teamed in the first-aid room, at a high-speed machine or across an executive desk. By *floating* the light to the best position for seeing, the user completely controls intensity and position. And a finger-tip touch *changes* either, each time the job requirements change.

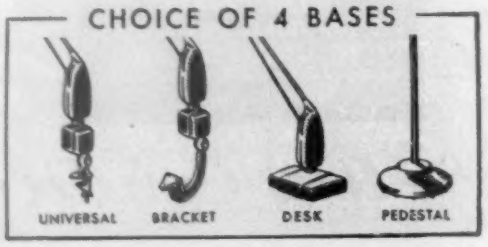
If you are accustomed to stationary lighting, or a lamp of restricted motion, the free movement of light in *all planes* will intrigue you. Dazor alone has the patented *Floating* Arm and its device for holding the reflector firmly, without locking or manual tightening.

But more important than the *how* is the *why* of Dazor illumination. Employees who enjoy this comfortable, glareless lighting see fine details more clearly on machining, assembly, inspection, drafting and other exacting operations. As errors and hazards decline, there is a rise in morale. Special skills come to the front and productivity shows a gain.

Phone Your Dazor Distributor for typical applications by other users or an on-the-spot demonstration. For the name of this nearby lighting authority, if unknown to you, write to Dazor Manufacturing Corp., 4481-87 Duncan Ave., St. Louis 10, Mo. *In Canada* address inquiries to Amalgamated Electric Corporation Limited, Toronto 6, Ontario.

MOVES FREELY INTO ANY POSITION AND STAYS PUT—*WITHOUT LOCKING*

CHOICE OF 4 BASES



DAZOR FLOATING LAMPS

FLUORESCENT and INCANDESCENT

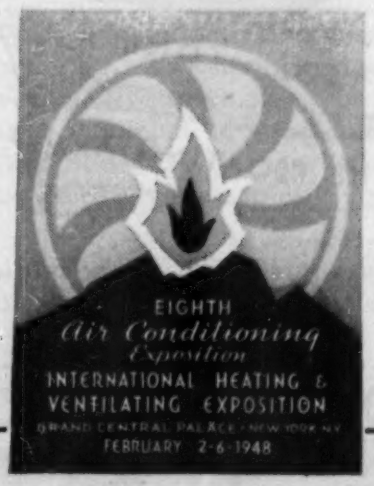
Portals to Progress

...in AIR CONDITIONING–HEATING–VENTILATING

Assembled here you'll see over 350 arresting displays and demonstrations of the newest and best ways to heat, ventilate and condition air in all types of industrial plants. Here in less than a week's time you can study and compare first-hand the relative merits of everything from complete units to maintenance supplies—in the light of your office and factory needs . . . discuss your problems and plans with technical attendants at the booths—men on hand expressly to help you with your problems, tell you what you want to know to keep abreast of the trends and practices in these active fields.

The wealth of worthwhile stimulating ideas, information and contacts at this exposition may save you much time, trouble and expense.

Plan now to attend—have your associates come too. Mark the date.



Under Auspices of
American Society of Heating & Ventilating Engineers

8th Air Conditioning Exposition

Management International Exposition Co.

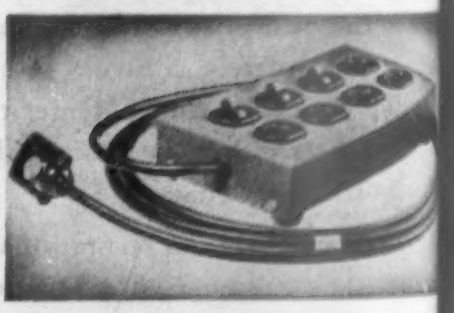
is caster type, to permit turning truck in its own length. The truck has 400-lb capacity. The manufacturer, Scott Aviation Corp. (Materials Handling Div.), Lancaster, N. Y., has acquired the producing and sales rights of the "Easy Tote" Products Co., Arcade, N. Y.

RUBBER MAT

Rubber door mat, approximately 5/16-in. thick, has top molded with circular indentations. Bottom of the mat is cloth so that dirt collects in the indentations and the mat can be cleaned by turning it over. Made in two sizes, 15x25 inches and 24x36 inches. The B. F. Goodrich Co., Akron, Ohio.

MULTIPLE OUTLET BOX

Providing outlets for multiple electric connections from a single source, Control Panel contains three single outlets controlled by individual switches, and one duplex live outlet. They are flush mounted in a box-type steel housing 4½x8x1½ inches. Heavy bus bar wiring is used for maximum current capacity and 8-ft. rubber covered cord is included. Attachment plug contains



fuses rated at 15 amperes. Unit is equipped with rubber feet. Ewart, Heller & Koch, Inc., 248 Boylston St., Boston.

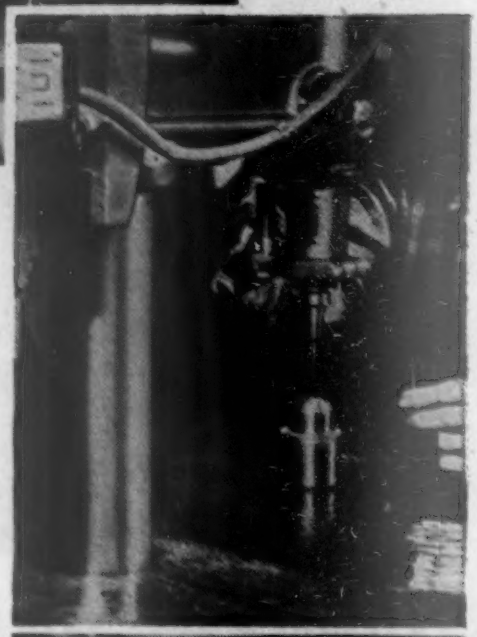
SYNTHETIC COATING

Designed to insulate and protect electroplating racks, synthetic Unichrome Coating 218 contains all solids, with nothing to evaporate. A baking synthetic, it is applied by dipping or spraying, and on curing at 350 deg. F. becomes a smooth elastic coating. On some racks thicknesses up to ¼ inch can be obtained in two hours, and, according to the manufacturer, the coating withstands mechanical abuses without chipping, tearing, or lifting from the equipment. Also said to withstand var

Turning with 15" Walker-Turner Drill Press

A battery of twelve threading machines made up with two Walker-Turner drill heads on each column. Produce class #3 threads at very fast production.

Tapping with 15" Walker-Turner Drill Press.



Threading with Walker-Turner Drill Press

"We Make Screw Machine Parts . . . . . with 30% Production Increase"

CHARLES MARTI

Charles Marti, manufacturer of precision screw machine products, has combined screw machine techniques with Walker-Turner 15" Drill Presses with remarkable results.

"We have 58 Walker-Turner Drill Presses in our plant, all used in the manufacture of small screw machine parts ordinarily made on Swiss Automatics. These parts range in size from 1/32" to 3/8" in diameter, 3/4" to 5" long and are held within .002 limits.

"Each machine performs a single operation. All machines are equipped with special turning fixtures which are adjustable to any size; twelve installations have two heads mounted on each column and do the work of threading machines. All tools and bushings are submerged in oil.

"With this method, we showed a 30% increase in production in the manufacture of needles for lettering pens as compared with the former screw machine method. All work is done by unskilled operators.

"We intend to continue using this method because it assures flexibility of operation, and is particularly economical in making short runs. New jobs do not require sets of cams, only resetting of tools."

CHARLES MARTI, *President*
Charles Marti Precision Screw Machine Products
Newark, N. J.

TWENTY-FIFTH YEAR
1922 1947

walker-Turner COMPANY, Inc. PLAINFIELD, N.J. U.S.A.

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS 141

MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS • RADIAL SAWS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

NOW! A Vacuum Cleaner that cuts cleaning costs!

Read how the new General Electric Industrial-Commercial Vacuum Cleaner increases efficiency, cuts expenses.

ELIMINATE the mop, the pail, and the broom . . . save man-hours in cleaning!

General Electric's new Industrial-Commercial Vacuum Cleaner gives you power, portability, long life.

Its powerful suction action removes dirt *quickly, completely*. Surfaces are protected and preserved . . . floors, linoleum, carpeting actually *last longer*.

It has the dependable G-E motor and tested construction that insure years of efficient service. Each machine is backed by the company warranty. It's so simple to operate, one man can use it with *no previous training.*

General Electric provides all tools—including specially designed ones for out-of-the-ordinary cleaning tasks.

Two types available: (1) Combination wet and dry pickup. (2) Dry pickup. For further details, mail coupon below. General Electric Company, Bridgeport 2, Conn.

FAST • EFFICIENT • QUIET • ECONOMICAL

The New General Electric

Industrial-Commercial Vacuum Cleaner

GENERAL ELECTRIC

A & M Department, General Electric Company, Bridgeport 2, Conn.

Sirs: Send me descriptive literature concerning the

( ) Combination Wet and Dry Pickup Vacuum Cleaner
( ) Dry Pickup Vacuum Cleaner

NAME OF INDIVIDUAL.....

NAME OF FIRM.....

ADDRESS.....

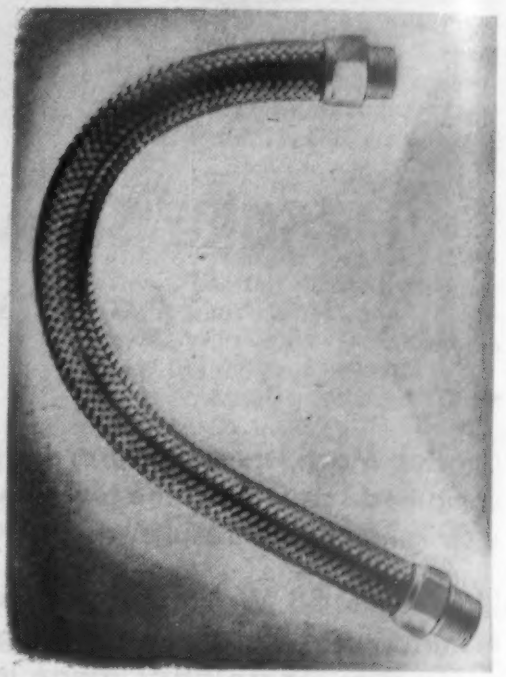
CITY.....STATE.....

134

strong chemicals, hot cleaning solutions, and plating baths. Suitable for use on dipping baskets, wire screens, mixing equipment, and as gaskets and linings. United Chromium, Inc., 51 East 42nd St., New York 17.

FLEXIBLE TUBING

Flexible metallic tubing is made from monel metal for use where severe corrosion or temperatures about 300 deg. F. are encountered. Furnished in four types, depending on the melting point of the solder used in the seam of the inner-core, ranging from 358 to 1785 deg. F. Can be used in high- and low-pressure steam lines. Supplied in standard sizes



with either single or double bronze braid and brass fittings. Monel fittings and braid can be supplied for special requirements. Titeflex, Inc., 505 Frelinghuysen Ave., Newark 5, N. J.

PAINT SPRAY HEAD

Paint spray system comprises a head, for attaching to suction-type paint spraygun, and disposable paint cups

containing different colors or types of finishes. Thumb lever locks the head to the rigid, metal-bottom paper paint

GO — NO-GO gaging tells only if workpiece is off size

USE DIAL INDICATORS FOR INSPECTING

ANGLE • CONCENTRICITY

DEPTH • HEIGHT

CURVATURE • LENGTH

INSIDE DIAMETER

LOCATION • THICKNESS

OUTSIDE DIAMETER

SQUARENESS • THREAD

WIDTH • AND COMBINATIONS

OF DIMENSIONS

Federal Dial Indicators show where and how much

THE BLIND SPOT
in old-fashioned gaging methods

THE conventional "go — no-go" gage serves only one purpose — it cuts down the passing of defective workpieces. It does nothing to reduce the number of rejects — nor to improve the quality or quantity of output.

Up-to-date gaging methods tell you the what, where and how of your workpieces. You not only cut inspection costs; you also cut production costs and get more production of a better quality.

You gain definitely more by using Federal Dial Indicators because: (1) you instantly *see* your dimensions — you don't feel for them; (2) you actually *see* the amount of the variation. You know exactly *how much* and *which way* each workpiece varies from its specifications.

When used constructively at production as well as at inspection, Federal Dial Indicators tell you much more than the yes and no answers of conventional gages. They tell you when and where production is tending to produce unsatisfactory work so that you can adjust the machine before this happens. And they are, of course, faster, positive and convenient for checking tools and gages and in your laboratory.

Day-in and day-out use demonstrates the durable accuracy of these Dial Indicators. Precisely cut gears, precisely set jewel bearings and parts, plus the *low-friction* of the movement, provide an exceptional sensitivity that enables faithful magnification regardless of the intensity or the degree of the change in dimensions.

The Cushioned Movement—specially designed to withstand repeated shocks — can be had on all but the smaller sizes of Federal Dial Indicators. The physical appearance is the same as that of the regular models. This shockproof mechanism has proved its merit under competitive conditions. Oil film on the spindle does not affect it. It has repeatedly demonstrated its ability to endure when others failed.

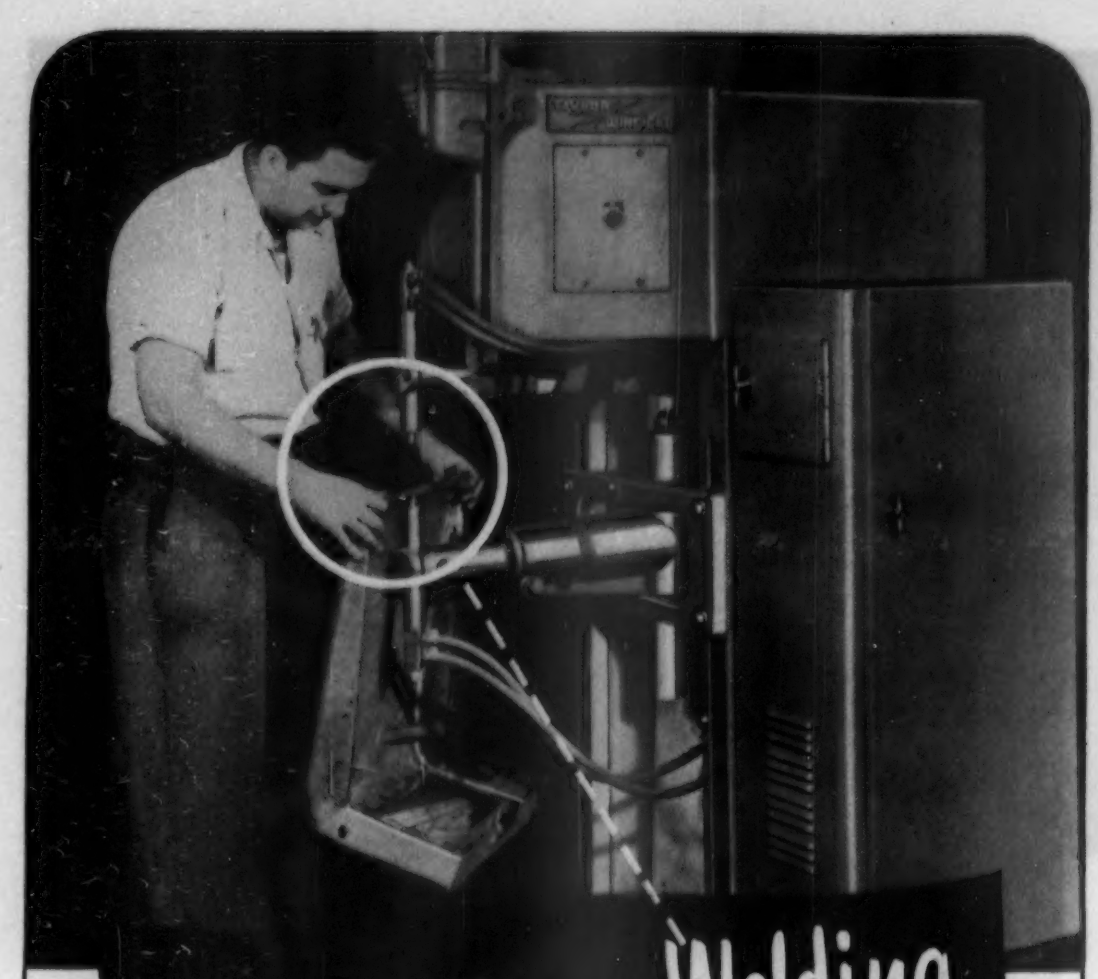
You can obtain practically any dial graduation or other physical requirement consistent with efficient Dial Indicator performance from Federal. Let a Field Service man consult with you on your Indicator application requirements . . . Write us for illustrated Bulletin No. 96

FEDERAL

FEDERAL PRODUCTS CORPORATION

1144 Eddy St., Providence 1, R. I.

● **Dimensional Dial Indicators and Indicating Gages — mechanical, electronic, air, multi-dimensional • Automatic Sorting • Dimensional Machine Control • Combinations of these methods. For the Mechanical, Textile, Rubber, Paper and all industries requiring dimensional accuracy.**



Put Resistance Welding Costs on the spot

...use Ampco-Weld resistance welding electrodes in modern equipment...increase the number of welds made, substantially reduce your costs

Sturdy! Versatile! These are the words that best describe this spot and projection welder, because it provides long life operation with a minimum of maintenance.

The same words apply to the Ampco-Weld electrodes used in this machine. Here's why:

Terne plate and galvanized stock, as you know, normally require the use of R.W.M.A. Class I electrodes. Yet, these two items are easily handled by Ampcoloy 97, a Class II alloy that combines the conductivity of Class I with the hardness of Class II. The ability of Ampcoloy 97 to do such jobs gives you clean welding and longer electrode life.

It pays to use Ampco-Weld electrodes in your resistance welding set-up. Get a supply today and see for yourself. The Ampco-Weld line is complete—it includes standard and special holders. All products meet R. W. M. A. specifications. Call your nearest Ampco office. Write for our latest fact-filled bulletin — it is just off the press.

MEMBER RESISTANCE WELDER MANUFACTURERS ASSOCIATION RWMA

Ampco Metal, Inc.

Department FM-11 Milwaukee 4, Wis.

AMPCO

Field offices in principal cities

RW-9

cup. Permits rapid change-over from one color paint to another. Innerlock self-sealing lids protect the paint cups and contents when they are not in use. Bradford Products Co., 2021 Cass Ave., St. Louis 6.

WELDING TUBE TESTER

Tester for welding control tubes tells at a glance the state of emission, and indicates internal short circuits of Type 82 and 83 rectifiers, as well as the FG-33,

FG-95, and 632 thyratrons. Terminals are provided for a cathode ray oscillograph for use in conjunction with the tester to indicate the condition of the voltage drop in the tube. Sierra Electronic Corp., San Carlos, Calif.

FIRST AID KITS

Line of first aid cabinets and kits, made in sizes for different needs, contains

standard medicinals and bandages. Portable Model E industrial steel cabinet, of rust-proof, dust-proof construction, contains 203 basic first aid units. Columbia First Aiders., Div. Columbia Industries, 5734 North Western Ave., Chicago 45.

RENEWABLE CARTRIDGE FUSES

Line of renewable cartridge fuses is designed for shockproof servicing and rapid renewal. The knifeblade-type fuse has two main parts: a cartridge case with no exposed ferrules or bolts, and a link-blade assembly. When blowouts occur, gases, heat, and pressure are said to be safely dissipated through a "controlled vent passage" formed between the V-

"Cold-Laid Mastic is an All-Round Utility Floor"

Why do we make this claim?

Because Industrial Asphalt Mastic Floors made with Flintkote Flooring Emulsions can be laid quickly . . . over concrete, wood, steel, brick, or any other firm base.

They're equally efficient either for new construction or for resurfacing... for large areas or small... may be placed by hand troweling or power float method.

Flintkote Flooring Emulsions give you a tough, durable, heavy-duty industrial mastic floor with high traction value wet or dry. And one that can resist the heaviest traffic.

Workers like mastic because it forms a warm, comfortable, resilient working surface... because its shock-absorbing and sound-deadening qualities make any plant a more quiet, more pleasant place to work.

These are a few reasons why we recommend Industrial Asphalt Mastic Floors made with Flintkote Flooring Emulsions for almost *any* industrial flooring requirement. Write for specifications today.

THE FLINTKOTE COMPANY
INDUSTRIAL PRODUCTS DIVISION
30 Rockefeller Plaza
New York 20, N. Y.

Atlanta
Boston
Chicago Heights
Detroit
Los Angeles
New Orleans
Washington
Toronto

FLINTKOTE INDUSTRIAL PRODUCTS

FLINTKOTE

Products for Industry

EVERY DAY IS MOVING DAY IN YOUR PLANT!

A-F ENGINEERED CONVEYOR SYSTEMS MOVE PRODUCTS *FASTER!*

WHY BE SATISFIED WITH LESS?

Day in and day out, plant managers are faced with a man-sized job of "moving"! Raw materials and finished products should "move" in an endless stream from the receiving department—through the plant—on to storage and shipping. Do yours?

The smoothness and efficiency with which materials and products are kept moving without handling is the key to lower operating costs.

If you wish to decrease handling costs in *your* plant, to a point where it means *real savings*, let A-F Engineers — who have demonstrated their "know-how" in many of the nation's leading plants — show you the advantages of an A-F plant-wide conveyor system. Write, without obligation — TODAY!

THE ALVEY-FERGUSON COMPANY

Established 1901

141 Disney St. Cincinnati 9, Ohio

Offices in Principal Cities Coast-to-Coast

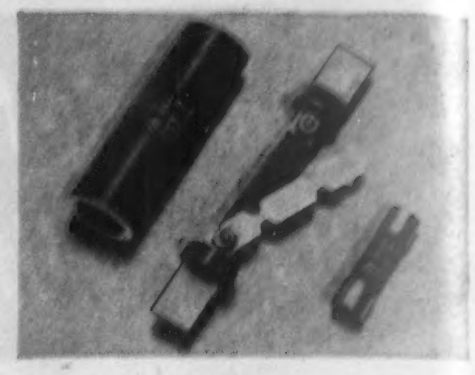
CONVEYING EQUIPMENT

A-F CONVEYING MACHINERY

Alvey-Ferguson

METAL PRODUCTS CLEANING EQUIPMENT

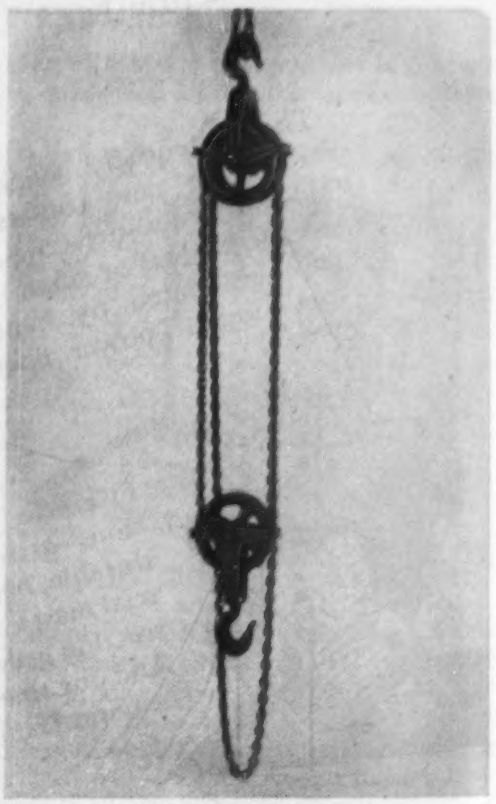
shaped threads of the brass plug and the square-shaped case threads. The ferrule-type fuses are equipped with renewable "timed-lag" fuse links, to protect equipment and wiring against shorts and



damaging overloads; and to reduce blowouts from momentary overloads and current surges. Made in sizes from 3 to 600 amperes, 250 or 600 volts. Solar Electric Corp., Warren, Pa.

CHAIN HOISTS

Differential chain hoist, made in ¼-, ½-, 1-, and 1½-ton capacities, is said to hold its load at any point. Features full weight sheave wheels, high tensile malleable iron frames with reinforcing ribs, drop-forged heat-treated hooks, and "special analysis" hoist chains precision-made to fit sheave pockets. Lower hook is mounted on ball thrust bearing for alignment of loaded chain to upper pocketed sheave and swiveling of load.



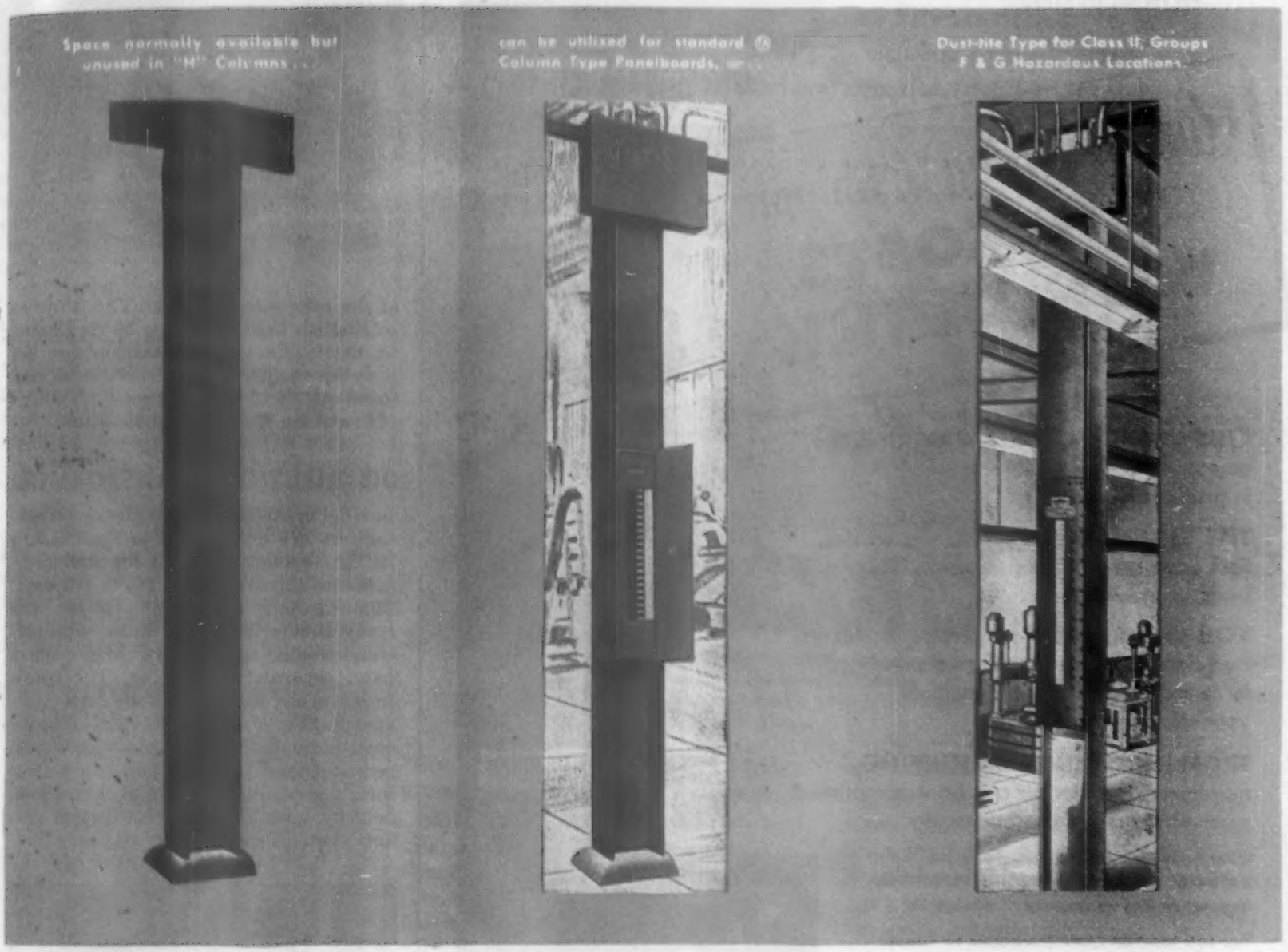
The hoist has few parts, and is light in weight without sacrifice of strength, maker says. Chester Hoist Co., Lisbon, Ohio.

MICROMETER

Direct-reading micrometer permits measuring journal diameters without removing the crankshaft from the engine

Economical . . .

in more ways than one


Space normally available but unused in "H" Columns . . .
can be utilized for standard (FA) Column Type Panelboards, or . . .
Dust-tite Type for Class II, Groups F & G Hazardous Locations.

(FA) Column Type Panelboards save wall and aisle space by mounting between flanges of "H" columns, and reduce voltage drop with shorter branch circuit runs by locating in center of area controlled.

Available now, in standard or dust-tite construction with (FA) Thermag or Dublbrak Circuit Breakers, 4 to 42 branch circuits, 15 to 50 amperes capacity, for 3 or 4 wire mains. Write for Bulletin 301.

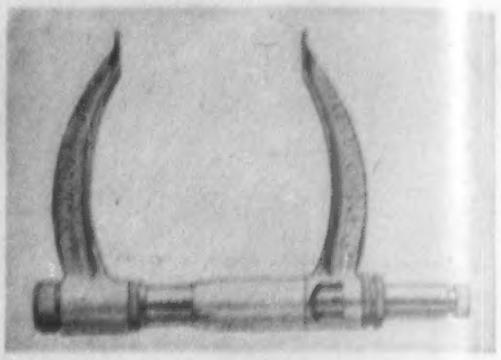
Frank Adam Electric Co.

ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

RECEIVING TO STORAGE
STORAGE TO PRODUCTION
From Receiving to Shipping
CLIP COSTS WITH CLARK
PRODUCTION TO ASSEMBLY
THIS IS THE MODERN WAY to handle any material that can be assembled in palletized units . . .
THE CLARK FORK TRUCK lifts, carries, tiers anything in cartons, barrels, bags, crates, drums . . .
YOU CAN REDUCE demurrage, accidents and damage losses. By tiering units to ceiling heights you can multiply your storage space . . .
FROM RECEIVING TO SHIPPING, movement of materials can be accomplished more efficiently and economically . . .
ASSEMBLY TO WAREHOUSE
Meet us in Cleveland in January at the NATIONAL MATERIALS HANDLING EXPOSITION Convention Hall — January 12 through 16
You can count on Clark Tructractor to "steal the show" as it did in '47 with sound, practical, new ideas for cutting handling costs. Both gas-powered and battery-powered fork-lift trucks and towing tractors, together with attachments—products of Clark's traditional quality, versatility and leadership.
WAREHOUSE TO SHIPPING
CLARK EQUIPMENT COMPANY
TRUCTRACTOR DIVISION
BATTLE CREEK, MICHIGAN
CLARK GAS OR ELECTRIC POWERED FORK TRUCKS
AND INDUSTRIAL TOWING TRACTORS

block. It provides ample reach for all size crankshafts. Two forged steel arms with ground and lapped tips are simultaneously adjusted with a micrometer screw. Measurements taken are said to be accurate to .001 inch. Clear graduations and numerals are recessed in a window-type opening in the frame. Drop forged steel jaws are ribbed. Capacity



of the micrometer is from 2 to 3 inches in English calibration, or 50 to 75 mm. in metric. Enclosed in wooden case, set includes adjusting wrench, checking standard, and instructions. Tubular Micrometer Co., St. James, Minn.

DISTRIBUTION TRANSFORMERS

Small, lightweight distribution transformers are engineered to meet E.E.I.-NEMA recommendations for standardization of the units from 1½ to 100 k.v.a., 2400 through 15,000 volt classes. The spray Bonderized steel tanks, with machine welded seams, have three coats of paint separately baked on. The transformers are equipped with high voltage pockets of one-piece deep-drawing steel permanently welded to tank wall; recessed tank bottoms; and low voltage bushings mounted with a gasketed joint held by a removable, pressed steel gasket ring. Also feature standard flat-

slotted lugs on internal low voltage leads, which allow quick change from series to parallel. Allis-Chalmers Mfg. Co., Milwaukee.

VENT CAPS

Vitrified clay cap slips over any bare vent or stack. The non-conducting material is said to eliminate the incendiary

hazard of lightning, and to be immune to oxidation and corrosion. Available in 6-, 8-, 12-, and 15-in. diameters. Inner and outer surfaces are smoothly finished to preclude possible accumulations of noxious exhaust residues or other vaporous and gaseous solids. The Robinson Clay Product Co., Main & Church Sts., Akron 9.

EMERGENCY LAMPS

Big Beam auxiliary lamps can be used for emergency lighting when regular circuits fail. Single-head Model 801 and Dual-head Model 802 project a 2000-ft. light beam, and can be equipped with floodlight snap-on lens. The lamps have chromium finished heads, and operate on four standard dry cell batteries. The lamp is plugged in a receptacle on the lighting circuit with a cord and plug leading from a relay unit in the lamp. When a circuit failure occurs, the relay acts in reverse, and automatically

switches on the lamp. The units can be converted to portable hand lamps by storing the extension cord in the relay housing compartment. Lamp heads may be turned 360 degrees in any direction. U-C Lite Mfg. Co., 1050 West Hubbard St., Chicago 22.

PROTECTIVE PAINT

Strong adhesion to all types of metals, high resistance to abrasion, and impervious properties are claimed for the Metalast System of painting. Compounded to prevent the corrosion of industrial equipment, it consists of three elements. The washcoat primer, applied as a single coat, serves as an anchor for subsequent coatings. Two or three coats of the second element, the anti-corrosive, may be applied within a few hours. The third, the top coat, may be aluminum,

Carton Cost 30% Less!

Mushroom packer uses Acme Silverstitcher to save on materials and labor . . . doubles production . . . makes a stronger carton, unaffected by dampness

STURDY PACKING FOR FINE FOOD SPECIALTY—Dampness no longer affects the sealing of the cartons in which these carefully grown and packed mushrooms are shipped. The Acme Silverstitched carton is stronger than before, costs less and can be made twice as quickly.

"Show us!" said the world's largest growers and canners of mushrooms.

An Acme Shipping Specialist had analyzed the packing operations of this company and advised an Acme Silverstitcher with Silverstitch wire for stitching the bottoms of shipping cartons. For years a fairly good carton had been sealed with glue. Nevertheless, an Acme Silverstitcher was installed in the shipping department and a trial was made.

Here is what this company wrote . . .

". . . results were a surprise to us . . ."

"First, we found a saving in material and labor of approximately 30%. Second, we can stitch 100 cartons now in the same time it took to glue 50. Third, the staples give us a stronger carton unaffected by dampness. And fourth, our operators prefer the stitching to the old method of gluing. We recently installed another Acme Silverstitcher in our Hudson, N.Y., plant and the results are just as pleasing."

Significant savings like these are worth inquiring about. Ask an Acme Shipping Specialist to look over your packing and shipping operations without obligation. Or mail the coupon for more information.

ACME STEEL COMPANY

NEW YORK 7 CHICAGO 8
ATLANTA LOS ANGELES 11

Acme Steel Company, Dept. FM-117
2838 Archer Avenue
Chicago 8, Illinois
Gentlemen:
Send me your free booklet describing Acme Silverstitchers and their applications.

Name .....
Company .....
Address .....
City .....Zone....State.....

ACME & MORRISON Silverstitchers
REG. U.S. PAT. OFF.

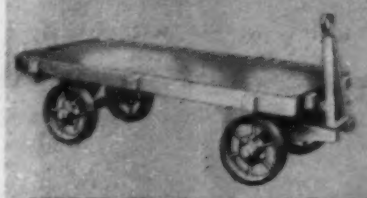
AND SILVERSTITCH BOX-STITCHING WIRE

EWC TRAILERS

Cut Handling Costs!

Specially designed to move material more efficiently. EWC Trailers are available in standard or special models for every hauling range . . . and in any capacity desired. Send for complete information.

MODEL 1002 Caster Trailer. Capacity 4000 lbs. For freight terminals, warehouses, and docks . . . extensively used where need is for combination of hand use and power-drawn trains.



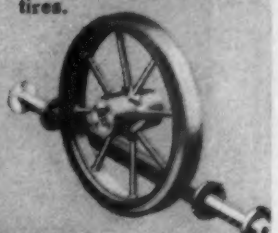
MODEL W3. Cap. 3 tons. For industrial plants of all kinds . . . excellent for inter-plant service. Standard 5th wheel type. Solid or pneumatic tires.

MODEL WP-5 Cap. 4-5 Tons. For general industrial service . . . trails accurately in trains. Solid or pneumatic tires.

EWC Wheels

Wheels with steel tires.

Wheels with pneumatic tires.



Replacement wheels and axles. (Wheel with molded-on tire illustrated.)

ELECTRIC WHEEL CO., Quincy, Illinois, Est. 1890

JUST OFF THE PRESS!

FREE

This valuable booklet of

SHIPPING ROOM INFORMATION

WRITE FOR YOUR FREE COPY TODAY

Helpful hints and information for the shipping or labeling departments of your business. This booklet also contains a complete description of the D.-B. equipment and supplies for performing these operations. Look in your telephone book under "Stencil Cutting Machines" for your local D.-B. distributor. Call him and ask for a copy. No obligation. Or write: Diagraph-Bradley, Dept. T 3745 Forest Park Blvd., St. Louis 8, Mo.

D.B.

but varies according to color desired, and usage. The coatings all air-dry in 15 to 20 minutes, maker says, and may be brushed or sprayed. Can be used as a preservative for storage and process tanks. C. A. Woolsey Paint & Color Co., Inc., 229 East 42nd St., New York 17.

GAS HEATER

Cladon-Hicks circulating gas space heater is designed for safety and long life. Having an 11,500-B.t.u. input, it is said to burn all the gas with less than 2/1000 of 1 per cent monoxide generation. Available vented or unvented. Gas inlet is direct-connected with copper tubing and brass Tee having volume adjustment. Lighting port gives positive

igniting, according to the manufacturer, without flash-back. Finish is scratch-proof and heat-resistant. Appliance Mfg. Corp., 346 South La Brea Ave., Los Angeles 36.

CUSHIONED CHAIR

Industrial chair features a 14½-in. square, 3-in. thick cushion seat made of

fine rubberized hair, protected by a thick jute pad, and covered with service-weight twill. It is reversible, held in place with a heavy steel seat pan. Maker states the cushion will not break down at the edges. A backrest with hand-wheel adjustment moves backward, forward, up, or down. The chair is of welded tubular steel construction. Telescopic legs adjust from 17 to 25 inches or 24 to 32 inches. Available with up-

The qualities you look for in high grade fasteners are assured by the

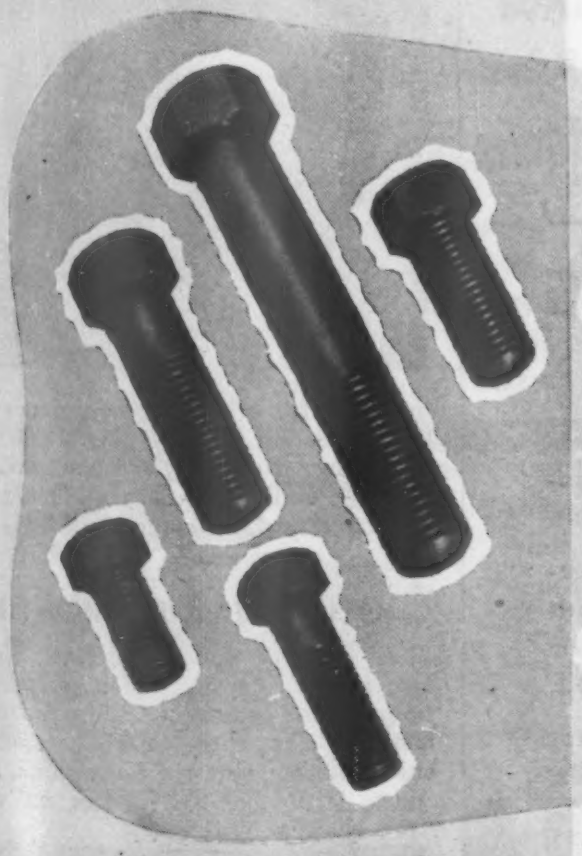
KAUFMAN DOUBLE EXTRUSION PROCESS

used in producing

CLEVELAND FASTENERS

Accurate forming to close tolerances
Uniform lead on threads
Threads concentric with shank
Class 3 fit
Correct heat treatment
Maximum strength

Build extra dependability into your products by choosing carefully your threaded fastener supply, whether standard or your own special design. High carbon or nickel steel cap screws and "specials" are made expertly here where the Kaufman Process was originated. Write for folder—"This is the Kaufman Process."



CLEVELAND *Top Quality* **FASTENERS**

Write for folder—"This is the Kaufman Process."

The Cleveland Cap Screw Company

2917 EAST 79TH STREET • CLEVELAND 4, OHIO

MADE BY THE ORIGINATORS OF THE KAUFMAN PROCESS FOR GREATER STRENGTH AND ACCURACY

Materials Handling Costs Are
An Important Part of Product Costs
Breakdown of a Typical Product Cost
MACHINING & PROCESSING
MATERIALS & PARTS
ASSEMBLY & INSPECTION
OVERHEAD
MATERIALS HANDLING
RECEIVED MATERIALS CONVEYED TO STORAGE
FROM STORAGE TO PRELIMINARY FABRICATION
TO FIRST PRODUCTION DEPT.
TO TEMPORARY STORAGE
TO FIRST MACHINING OPERATION
TO SECOND MACHINE OR PROCESS OPERATION
TO THIRD MACHINE OR PROCESS OPERATION
TO PARTS INSPECTION DEPARTMENT
TO SUBASSEMBLY
TO SUBASSEMBLY INSPECTION
TO FINAL ASSEMBLY LINE
CONVEYED ALONG ASSEMBLY LINE
TO FINAL INSPECTION
TO PACKAGING DEPARTMENT
TO WAREHOUSE
TO SHIPPING PLATFORM
This Chart from MILL and FACTORY—by Special Permission of Publishers

reduce costs with . . . **Generalift** ★★★★★ **PALLETS**

• One of the most "alive" subjects in the field of materials handling is the use of pallets. Palletized handling cuts costs. Palletized handling speeds production.

Generalift pallets and skids are tough and long lasting—made from sturdy hardwood—assembled with drive screw or ring shank nails. Stringers are flush or set in and special chamfering is available if needed.

Generalifts are manufactured in your sizes—prompt shipments. Call or write our nearest office for prices.

IMPORTANT NOTICE: *New plants and expanded production facilities are now in full operation. Your inquiry or order will receive* prompt attention.

25 YEARS YOUNG
1922·1947

General BOX COMPANY

GENERAL OFFICES: 504 N. Dearborn St., Chicago 10, Ill.

DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon, Natchez.

Continental Box Company, Inc.: Houston, Dallas.

ECONOMIZE . . . PALLETIZE . . . GENERALIZE!

holstered or masonite backrest. Another model has swivel mechanism, and the chair may be obtained with or without backrest adjustment. Royal Metal Mfg. Co., 175 North Michigan Ave., Chicago 1.

POWERED DUMBWAITERS

Line of power-driven dumbwaiters has 500-lb. lifting capacity, Cutler-Hammer controls, and all-welded steel construction. Has 12-ft. lift, and a wire-rope drive provides 40-f.p.m. lifting speed for the 3x3-ft. platform, which lowers to 30 inches from floor. An adjustable device is provided for the top sprocket. Wall brackets and rails are included. Units with special capacities and heights may be obtained. Sage Equipment Co., 30 Essex St., Buffalo, N. Y.

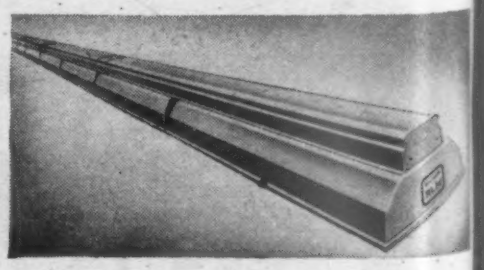
INDUCTION MOTOR

A.c. induction motor is squirrel cage, ball bearing, dripproof type. Rated 40 deg. C. continuous duty, 220/440 volts in three phase, 60 cycles, it can be operated on 50 cycles with a standard 50-deg. C. temperature rating. The motor has prelubricated sealed ball bearings. Pressure cast rotor with aluminum bars and end rings with integrally cast fan blades are

designed for efficient performance and cool operation. The 1-, 1.5-, 2-, 3-, and 5-hp. sizes run at 1750 r.p.m., and the 1-, 1.5-, and 2-hp. sizes at 1150 r.p.m. Kurz & Root Co., Appleton, Wis.

CONTINUOUS LINE LIGHTING

"Lite-Line 40" continuous line lighting system embodies Springlox safety lamp holders; and redesigned sliding hangers, channel couplings, and longitudinal shielding for the twin lamp units. Provides 45 to 100 footcandles on work



surface. The lamp holder is claimed to simplify removing or inserting lamps. A quarter turn of the reflector fastener unlocks the reflector from the channel.

. . . when AMERICAN PHILLIPS SCREWS Speed Assembly—Make Sturdier, Smarter TOYS

IN THE PLANT—It's a Xmas Bonus in time-savings (up to 50%) for toy manufacturers who cash in on the super fastening speed of American Phillips Screws. *Automatically* straight to drive, non-slipping, they can't harm product or personnel. Screws can't be fumbled, time can't be lost, heads can't be burred. Whether you make miniature trains or real ones, sofas or stoves, radios or refrigerators—output and savings go *up* when American Phillips Screws go *in!*

IN THE SHOWROOM—Toys (or whatever you make) have both a "can take it" and "take me with you" look! For children and grown-ups, there's the safety, non-snagging feature. American Phillips Screws join your sales promotion staff, make your product sturdy, eye and buy-appealing. And more and more buyers know it!

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Need any one or all Three?

a SECTION

a SYSTEM

a Portable All-Purpose UNIT

THE range and versatility of Standard Conveyor equipment is the result of nearly 40 years of close contact with conveying problems — large and small installations.

If you need just a light, portable section of conveyor to speed handling in warehouse or on shipping platform — complete, continuous flow system linking manufacturing or packaging operations — or a portable unit to speed handling in storage and shipping areas — Standard Conveyor Company can supply you with any one or all three.

Write for "Conveyors by Standard" Bulletin No. FM-117 — a valuable conveyor reference book that will be useful to you.

STANDARD CONVEYOR CO.
General Offices: North St. Paul 9, Minn.
Sales and Service in Principal Cities

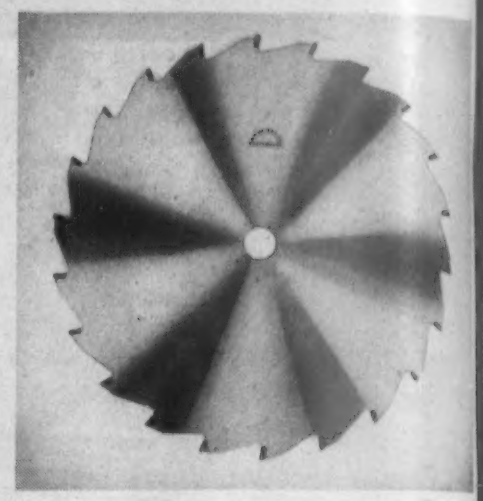
Standard
GRAVITY & POWER
CONVEYORS

ROLLER - BELT - SLAT - PUSHBAR CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS

and permits access to all sockets, wiring and ballast mounted in the channel. The sliding hangers permit mounting suspension fittings at any point on the line. The system is available in two reflector widths — Type A, 11½ inches wide, and Type B, 13½ inches. Benjamin Electric Mfg. Co., Des Plaines, Ill.

CARBIDE-TIPPED SAWS

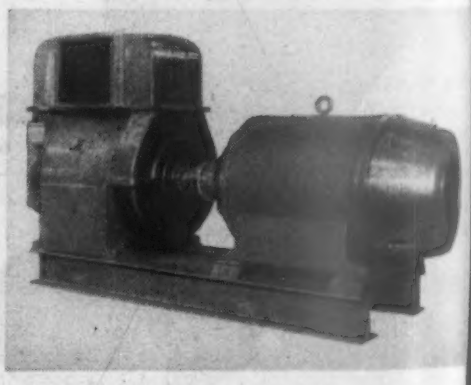
Line of carbide-tipped circular saws includes standard- and fine-tooth saws in six diameters, ranging from 8 to 18



inches. According to the manufacturer, the carbide tips have high resistance to wear and abrasion, require less frequent sharpening, need no filing, and provide smooth finishes. They can handle all types of woods, plywoods, composition boards, and plastics. W. F. Meyers Co., Inc., Bedford, Ind.

ENCLOSED GENERATOR

Line of totally-enclosed, unit-cooled generators has been built for use in motor-generator sets or in other generating applications in a non-hazardous



atmosphere. Available in ratings from 30 to 150 kilowatts. An air-to-air surface cooler maintains safe winding temperatures. Motor Div., General Electric Co., Schenectady 5.

HIGH-CURRENT RESISTORS

Edgeohm resistors are applicable for use as starting, dynamic braking, field discharge, and plugging resistors on d.c. or a.c. motor controllers; also for other intermittent duty high-current applications. Suitable for continuous duty use in load banks; for battery charging, welding, and plating rheostats; and for

BWH
BOSTON WOVEN HOSE AND RUBBER COMPANY
DEPENDABLE RUGGEDNESS
35-OZ SILVER-HARD DUCK
HIGHEST QUALITY FRICTION AND SKIM COAT BETWEEN DUCK PLIES

JUST KEEPS ROLLIN' ALONG

another top performance by a BWH product

Day in, day out, for over fifteen years, this tough BWH Bull Dog Transmission Belt has been steadily at work in one of America's great industrial plants. That's a record to talk about, but it isn't unusual for BWH Belts.

Made by the famous ROTO-CURE process of continuous vulcanization, these famous belts have long life and trouble-free performance built into every inch. Because potential trouble spots caused by press overlaps are entirely eliminated and the belt is uniformly stretched throughout its entire length, extra service is assured.

Under high stress, difficult operating conditions and on peak load starting, this rugged BWH Belt proved it could stand the gaff.

The success stories of Bull Dog Transmission Belts are matters of record in ore-crushing, refinery, paper, lumber and textile industries . . . to mention only a few. Whatever your needs for industrial rubber goods, look to BWH for dependable ruggedness . . . and to BWH distributors for dependable service!

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems . . . we're specialists in solving them. Consult your nearest BWH distributor, or write us direct.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all principal cities

PLANT: CAMBRIDGE, MASS., U.S.A. • P.O. BOX 1071, BOSTON 3, MASS.

Every user of Udylite equipment and supplies knows that there is an experienced Udylite plating engineer always ready to help him correct plating difficulties and improve practice. Udylite has the know-how of plating experience with every type of installation.

Udylite also maintains a pilot plating plant in which a user's particular problem is solved without interfering with his regular production schedules.

These services, in combination with Udylite's ample stocks of platers' supplies, provide *plus* values which only an organization like Udylite can furnish

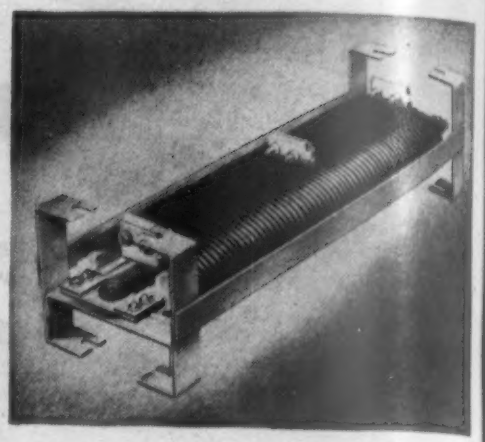
Udylite

THE UDYLITE CORPORATION

DETROIT 11, MICHIGAN

REPRESENTED IN PRINCIPAL CITIES

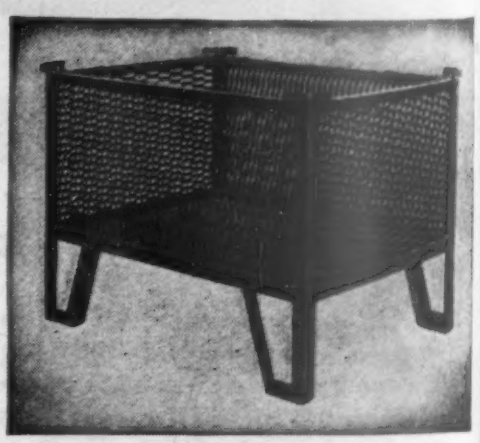
other equipment. Standard units are rated at 2200 watts for continuous duty, with resistances from 0.32 to 4.35 ohms, and with continuous current capacities from 21 to 79 amperes. Single resistors are available with stamped steel brackets, while multiple units up to four can be furnished in a single open frame.



Secondary insulation is provided. Additional clamp terminals may be supplied. Ward Leonard Electric Co., Mt. Vernon, New York.

MESH BOX

Heavy-duty, all-steel ventilated box can be used for materials requiring uniform cooling. Constructed of a heavy-gage steel mesh on four sides and bottom, with all-welded angle iron framework. The mesh affords visibility of contents, permitting identification of parts without unstacking or moving boxes. Built with legs for use with fork lift trucks or cranes, or can be made with casters, rubber, or metal wheels. Stacking guides



are welded on the corners for uniform stacking. Standard model has a rated load capacity of 8 tons, but the boxes can be made with capacities up to 30 tons. Palmer-Shile Co., 16007 Fullerton Ave., Detroit 27.

PLATFORM TRUCK

Utility truck, with 3x5½-ft. platform, handles manually loaded materials such as bagged cement, long pipe or bar stock, tote pans, tools, and permanent equipment up to 1500 pounds. Can be used as a mobile unit equipped with permanent fire-fighting apparatus, or with maintenance tools, pressure greasing unit, or other servicing facilities. It has full high and low speed in forward or reverse, and is powered by a Briggs & Stratton 2¼-

Johnson UNIVERSAL BRONZE BARS

● Expensive delays in securing bearing bronze can, for the most part, be prevented. Simply call in your local Johnson Bronze Distributor. Permit him to show you how you can buy exactly according to your needs from our list of 350 stock sizes. Then let him prove to you the excellent service available from stock. There is a Johnson Distributor as near as your telephone.

When you install Johnson UNIVERSAL Bronze you are assured the utmost in performance and long bearing life. There is no higher quality bearing bronze available.

Write today for a copy of our latest catalogue and the location of your nearest source of supply.

Look Bronze JOHNSON BEARING BRONZE WILSON J L & CO 1634 Penn av AT lantic 1220

in your phone book, classified section, for the name and number of your local Johnson Distributor.

Call your local Johnson Bronze Distributor

JOHNSON BRONZE

SLEEVE BEARING HEADQUARTERS

The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

512 S. MILL STREET NEW CASTLE, PA.

WHEN you bring your product or production engineering problems to Pioneer, you can be sure they'll receive thorough and competent study by our staff of production and engineering specialists. You can be sure, too, that their recommendations on materials, machines, tools, or systems are made *only* when they're sure "THE SHOE FITS." Their varied experience with other industry's problems frequently helps in solving your problem quicker.

TO BECOME BETTER ACQUAINTED WITH OUR ORGANIZATION . .

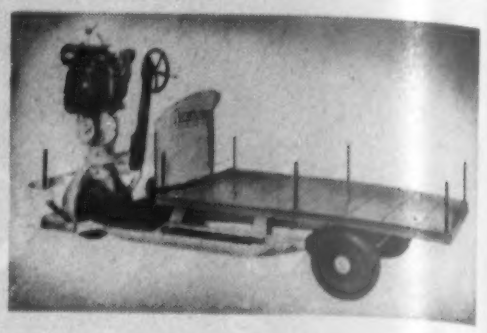
write (on your letterhead, please) for our booklet "The Answers to Industry's Problems," describing our complete service.

Pioneer Engineering and Manufacturing Company

19644 JOHN R ST., DETROIT 3, MICHIGAN

PIONEERing Better Production Methods and Tools

hp. gasoline engine. The truck will turn in its own length. Specifications are: 108-in. length; 72-in. wheelbase; 5½-in.



ground clearance; 16-in. loading height; and four 6-ply pneumatic tires, 14x4½ inches. Truck-Man Inc., 1405 West Ganson St., Jackson, Mich.

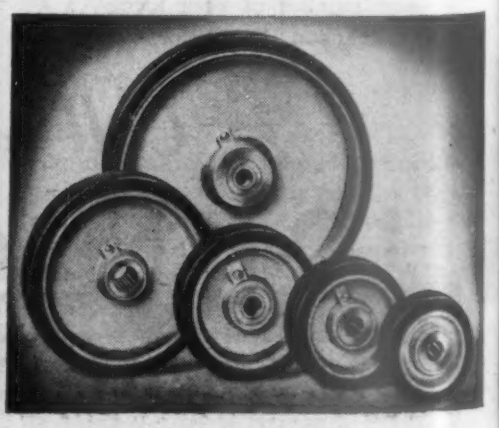
DUST RESPIRATOR

Workers exposed to poisonous, disease-laden, or nuisance dusts are said to be protected by Type R-2000 respirator. The chemically treated felt filter, ⅛-in.

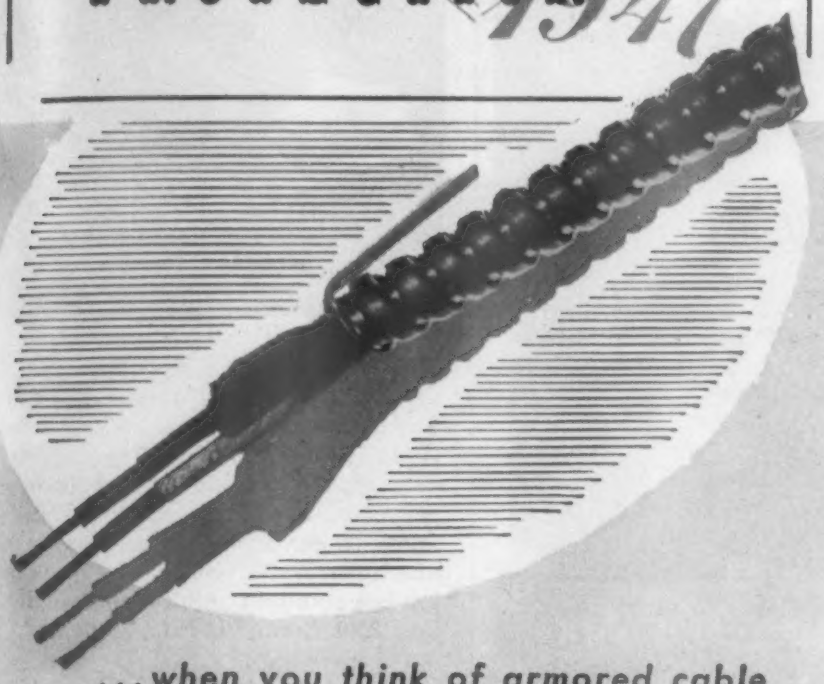
thick and slightly over 5 square inches in area, is claimed to equal the efficiency of untreated filters 42 square inches or more in area, and of the same thickness. This is effected without a proportionate increase in breathing resistance, maker states, and filter container is reduced in thickness and weight. The throw-away filter is equipped with a gauze pre-filter for catching larger particles of dust and dirt. American Optical Co., Southbridge, Mass.

ALUMINUM ALLOY WHEELS

Line of aluminum alloy industrial wheels ranges in size from 4 to 12 inches in diameter. They are available with either a molded on Grade A rubber tread, or all aluminum. Corrosion-resistant, the wheels may be furnished with



1897 50 YEARS OF DEPENDABLE PROTECTION 1947



...when you think of armored cable

THINK OF GENERAL ELECTRIC

• Armored cable has come a long way since the first coil was produced in 1897. And General Electric, a pioneer in the development and manufacture of this popular wiring product, proud of the part it has played in the steady improvement of armored cable, now offers the improved BX,* constructed with a bonding strip in sizes 14 and 12 Awg to assure low armor resistance.

Long a symbol of quality in the electrical industry, General Electric's BX is recognized as the leader among armored cables. That leadership is based upon the same skilled engineering, advanced manufacturing techniques, and quality control that make all General Electric wires and cables noted for long-term service and satisfaction.

That's why—when you ask for armored cable—you'll be *sure* of what you buy when you say "General Electric BX."

Let us tell you more about the many types of General Electric wires and cables. Write to Section W61-1134, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

Wires and Cables

GENERAL ELECTRIC

AROUND THE CIRCUIT with your GE Merchandise Distributor

THERMOPLASTIC INSULATION plays an important role in cable insulation today, too. Take PVX, for instance. This nonmetallic sheathed cable is lighter, has smaller diameter, and is more flexible than ordinary cables. These features are the result of skilled engineering in cable construction. They are built into PVX, to give you easy handling, to speed installations, and to *keep PVX on the job* after it has been installed. Let us give you more information on this outstanding cable. You'll find many uses for it.

OIL, ABRASION, AND ABUSE—equip with General Electric's Flamenol* cords to protect portable tools from these *service-shortening* enemies. Flamenol cords resist many common hazards, such as heat, acids and alkalies, twisting, kinking, and impact. Their long service will please you, and will help to keep your tools on the job: Ask us about the three available types—heavy duty, medium duty, and rip cord.

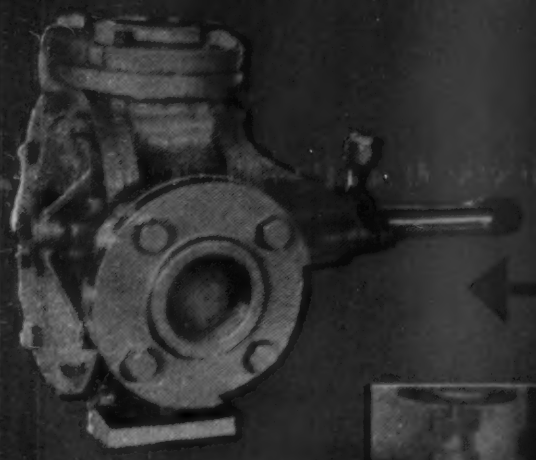
A DOZEN BATHS A DAY may sound like overdoing things, but not when you are talking about General Electric's testing laboratories. Here, samples of wire or cable are immersed in oil or water baths, and are tested for dielectric strength and insulation resistance. Many thousands of tests for these and other properties have been made for your protection. These careful checks on quality mean that when you order any General Electric wire or cable, you can always be sure that it will perform long and well in service.

SPECIAL WIRING JOBS call for wires and cables made for special service. In the big family of General Electric wires and cables, you will find rip cords, shot firing cords, bus-drop cables, telephone wire, brewery cords, fixture wires, and dozens of other types for virtually any application. Let us help you select the right wire or cable for that next unusual installation.

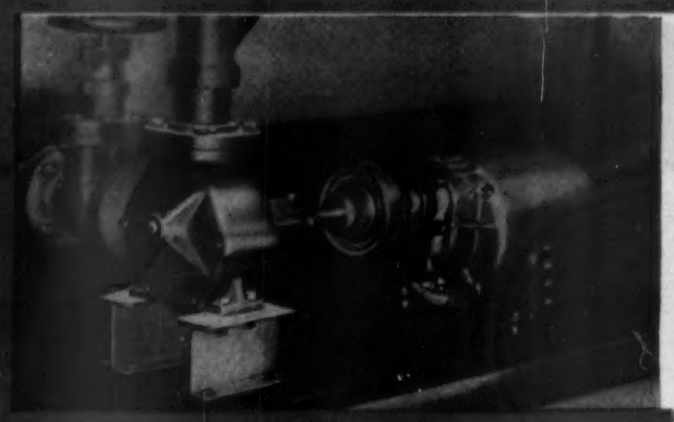
**Trade-mark Reg. U. S. Pat. Off.*

THIS IS THE FLUID

FLO-SWEET



AND THIS IS THE PUMP



AND THIS IS THE APPLICATION*

and This Is Why So Many Pumping Jobs Are Handled by Yale & Towne TRI-ROTOR

Positive handling characteristics and high volumetric efficiency are combined in one pump by means of the unique design of Yale & Towne's TRI-ROTOR rotary piston positive displacement pump.

It handles a wide variety of liquids — from volatile to viscous — without overheating, chewing, foaming or agitating the product.

Only 3 moving parts (two pumping members) — minimum operating and maintenance expense.

Optional and interchangeable: Variable Volume Control (with or without Manual Flow Control), Integral Relief or By-pass valve, Solid Head.

New:
Pressure Regulator Device permits operator to adjust hydraulic mechanism to control *both* volumetric capacity and discharge pressure without stopping the unit.

Sizes: 5 GPM to 200 GPM for a wide variety of industrial applications (see coupon below).

ECONOMICAL—*Rotary Action* . . . PROTECTIVE—*Piston Action* . . .
ONLY YALE GIVES YOU BOTH IN ONE PUMP

TRADE YALE MARK

Pump Division of
THE YALE & TOWNE MFG. CO.
Stamford, Conn., U. S. A.
Representatives in Major Cities

Makers of the Famous Lines of Locks, Hardware, Hoists and Industrial Trucks

Wire or mail your requirements to Pump Division,
THE YALE & TOWNE MFG. CO., 212 Henry Street, Stamford, Conn., U. S. A.
The Yale & Towne TRI-ROTOR Pump is now in use pumping such products as these (check applications which interest you)

☐ Alcohol	☐ Fish Oil	☐ Lacquer	☐ Shortening
☐ Caustics	☐ Gasoline	☐ Liquid Soap	☐ Silicate of Soda
☐ Chocolate	☐ Glucose	☐ Molasses	☐ Solvents
☐ Coolants	☐ Greases	☐ Oils	☐ Starch
☐ Corn Syrup	☐ Ink	☐ Paint	☐ Varnish
☐ Edible Oils	☐ Honey	☐ Propane	☐ Viscose

NAME_____

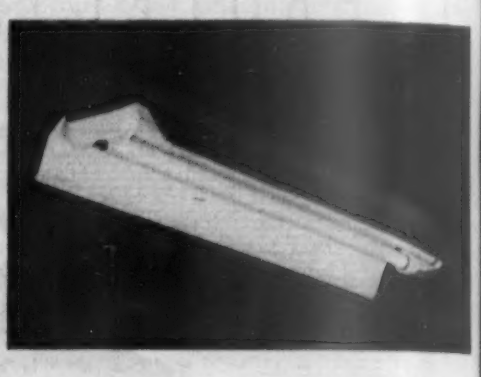
COMPANY_____

CITY_____ Zone _____ State

roller bearings, ball bearings, or bronze bushings. The roller- or ball-bearing-equipped wheels have grease fittings to facilitate servicing. Made in 4-, 5-, 6-, 8-, 10-, and 12-in. sizes, with all standard axle sizes, the wheels are lightweight. The 10-in. size, weighing 6½ pounds, has a 550-lb. load rating. Airlite Div., Aerol Co., 1823 East Washington Blvd., Los Angeles 21.

FLUORESCENT FIXTURE

Chan'l-Run design, internally mounted ballast, G-E turret sockets, and enlarged



wireway for continuous runs, are featured in the RD-80 fluorescent fixture. The vitreous porcelain enamel reflector is designed to a shielding angle of 14 degrees, a reflectance factor of over 79 per cent, and an over-all efficiency of above 80 per cent, according to the manufacturer. Watch-Dog or No-Blink starters are standard equipment. Holdenline Co., 2301 Scranton Rd., Cleveland.

DUMPER

Lifting and dumping quantities of free flowing materials, the Cesco dumper can be used for liquids, as well as for solids and semi-solids. The unit is

equipped with a 500-lb. capacity box type skip for loose materials or liquids or an open front skip with spikes to hold bagged materials. Stainless steel skips may be supplied. When a switch is turned, the skip with its load is automatically lifted and emptied into bins

Columbia University Libraries
Rush New Books to
Shelves in Record Time!
1. Nine copies of purchase order are made at one time, eliminating several operations.
2. Steps needed to put books in circulation are reduced from fourteen to seven.
3. Smaller, specially-designed "card-size" forms save paper and writing time.
4. Consecutive numbering of forms controls identification and reference.
PROCEDURE FLOW CHART

Exclusive Standard Register paperwork simplification saves most where savings count most!

COLUMBIA University Libraries' simplified acquisition procedure saves *days of delay* in putting new books in circulation, permanently catalogued.

Standard Register's exclusive methods of record *system analysis* and techniques of improvement by specific formula (which aided The Libraries) have been developed to help American business (1) reduce *paper work* and (2) eliminate operating wastes, errors, losses—with *better working papers.*

Demand for Standard Register marginally punched continuous forms and service is beyond all precedent. But it will pay you to wait. Remember, *only* Standard Register forms and devices give you the full benefit of Paperwork Simplification.

The Standard Register Company, 310 Campbell Street, Dayton 1, Ohio. *Pacific Coast:* Sunset McKee-Standard Register Sales Co., Oakland 6, California. *Canada:* R. L. Crain, Limited, Ottawa. *Great Britain:* W. H. Smith & Son, Ltd., London.

WHERE DO SAVINGS COUNT MOST?

Not in the price of printed forms. A difference in the quality of paper, printing, carbons, etc., may save a few hundred dollars at most.

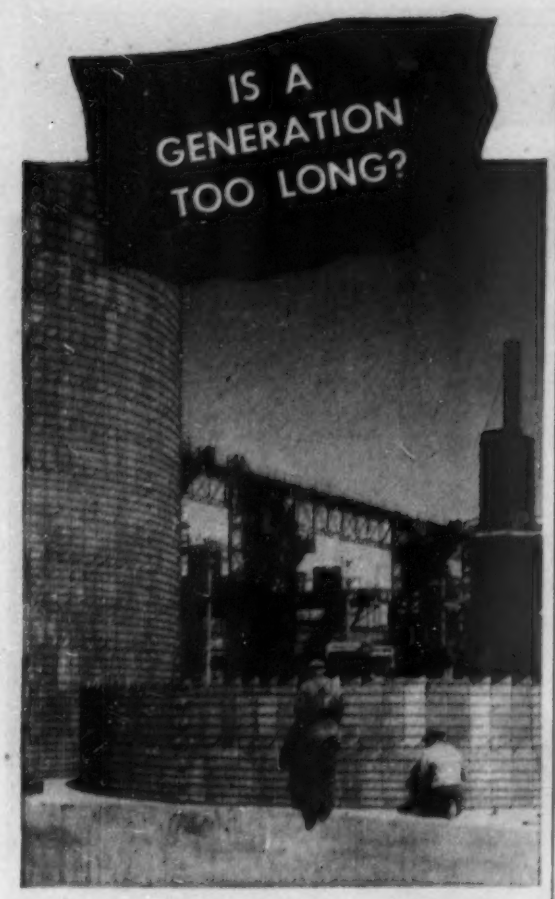
Not even in the cost of completed records... although the cost of writing, handling and using forms is 10 to 50 times the forms' cost. Savings here may run into 4 or more figures.

But in the cost of business operation, if waste, delay, inefficiency exist. SAVINGS here, through better management control, can reach almost incalculable figures!

Standard Register

MANUFACTURER OF RECORD SYSTEMS OF CONTROL FOR BUSINESS AND INDUSTRY

Bring Your Forms Up to Standard



Neff & Fry bins serve for a generation with virtually no upkeep expense. If you wouldn't want them to stand that long, they could be dismantled and reconstructed to fit another layout.

Each stave interlocks with six surrounding ones. This makes tight, rigid joints. Steel hoops are stretched around each tier to brace the staves against internal pressure. The bin can be disassembled by removing the hoops and detaching the staves.

The stave is formed under 14 tons' pressure, at least 5000 lbs. to the square inch — making it dense, smooth, strong.

Neff & Fry bins are erected by trained crews sent anywhere. Each job is specially engineered. Diameters and heights available as required. Ask for catalog containing full information and photos of installations.

THE **NEFF & FRY** CO.
CAMDEN, OHIO

SUPER-CONCRETE STAVE

NEFF & FRY
STORAGE BINS

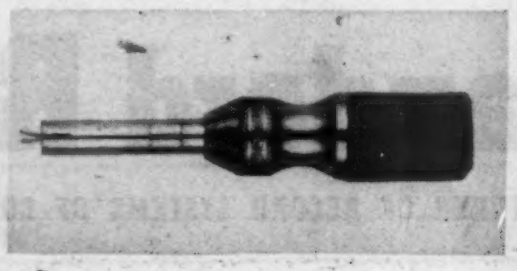
kettles, or other receptacles. The assembly is equipped with 5-in. ball-bearing swivel casters. Built in dumping heights of 5, 6, 7, and 9 feet. A ½-hp. motor operates the lift. Colson Equipment & Supply Co., Dept. FMM-1, 1317 Willow St., Los Angeles 13.

CENTER PUNCH KIT

Automatic center punch kit consists of punch No. C-15 (adjustable from 9- to 20-lb. pressure) or No. C-12 (preset to 15-lb. pressure), with accessories. Mechanism enclosed in plastic handle is an internal spring-actuated hammer released on specified hand pressure. "Shock absorber action" incorporated in Model C-15 permits cushioning the hammer impact at the control of the operator, to facilitate layout work and minimize distortion. A self-centering attachment simplifies mounting hinges and brackets. A tungsten-carbide point can be used for punch marking hardened steel or glass. Hole-cutting points enable punching .090- and .045-in. dia. holes in paper, fabrics, and leather. A chisel point for tooling soft metals, and a rivet point are other accessories. Vinco Prods., 326 Bond St., Asbury Park, N. J.

SCREWDRIVER

Named Slick 3-11, screwdriver can remove, hold, replace, and reseat a screw without the use of another tool. Available in 3½- to 9-in. sizes, and in two types, the insulated, all-metal tool has knurled aluminum handle. Maker states the driver has inverted flexible bits that do not slip out of the screw slot. The holder allows screws to be started at an



Your local Industrial Distributor has these

locating pins for the diemaker's work,— which also serve as perfect shafts for pins and pivots in various machine assemblies.

We make them of special-analysis ALLENOY steel, heat-treated to an extremely hard surface, with a core of the *right* hardness to prevent "mushrooming" when driven into a tight hole.

We grind them to a limit of .0002" over basic size, with an allowable tolerance of plus or minus .0001". Surfaces are finely polished; subsequently treated with a rust-preventive.

Their tensile strength is 240,000 to 250,000 psi. By their strength and accuracy they uniformly *retain* precision standards in tool, die and machine assemblies.

Write us for samples and dimensional data to indicate the wide range of uses of these *TRU-GROUND* Pins. Order from your Distributor's warehouse stock.

THE ALLEN MFG. COMPANY
HARTFORD 2, CONNECTICUT, U. S. A.

Direct VEEDER-READINGS

Save Costly Hours and Errors on all types of Products and Production Machines

NO DIALS TO READ: No "pointer-to-dial" reading to invite errors.

NO "INTERPRETER" NEEDED: Veeder-Readings are *direct* ... nothing to translate or decode. And the bold, black-and-white figures are *easy* to read.

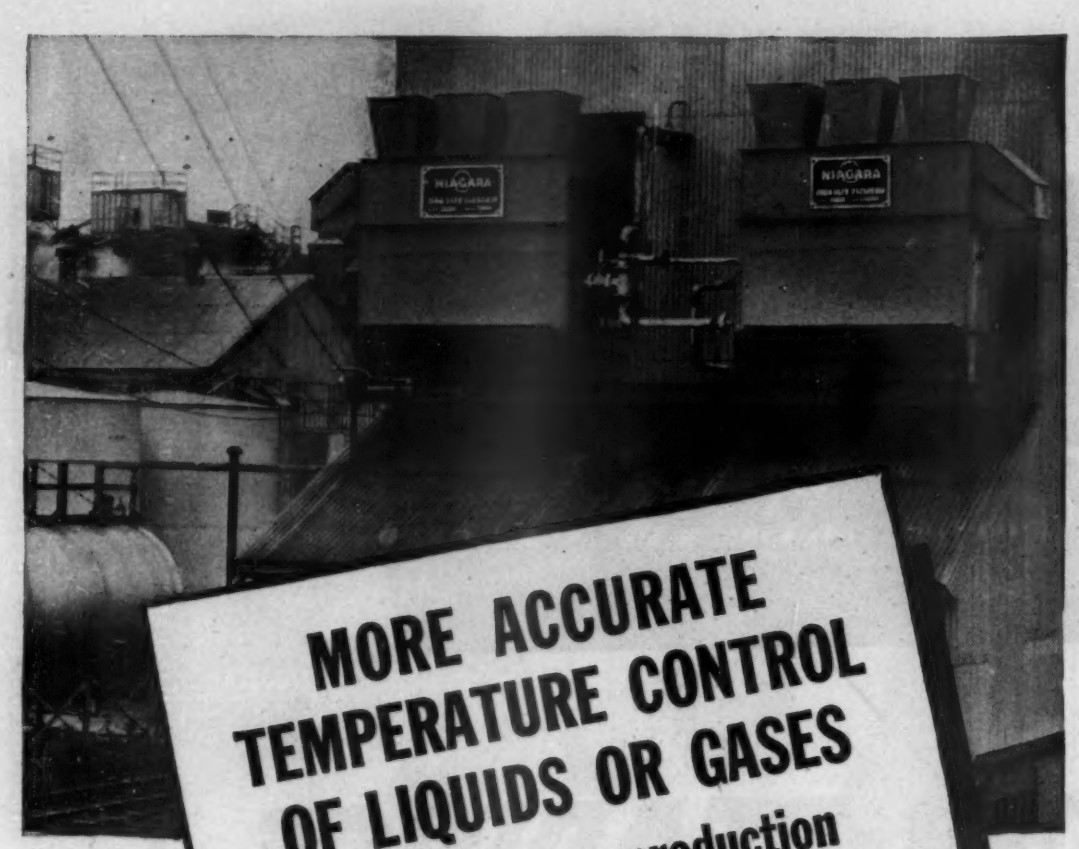
NO TIME LAG: Veeder-Readings are *up-to-the-minute* ... give you the whole story on production *as of now.*

NO TIME LIKE THE PRESENT: *Now's* the time to find out how Veeder-Root *Count*rol can count to *your* advantage, in your plant or in your product ... *or both.* Write.

VEEDER-ROOT INC.

HARTFORD 2, CONNECTICUT

In Canada: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3.
In England: Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.



MORE ACCURATE TEMPERATURE CONTROL OF LIQUIDS OR GASES

...to improve production and save expense

● The Niagara Aero Heat Exchanger is used as a liquid or gas cooler in many industrial processes such as cooling jacket water for engines or process equipment; cooling lubricants, cutting oils, quenching baths, electronic sets, transformers, controlled atmospheric processes; condensing of steam, vapor, acid gases; compressed air or gas cooling.

Compared to conventional methods, it saves the cost of over 95% of the cooling water and its attendant piping and pumping. Its extra advantage, closer control of temperatures, has been found vastly more important in improving the efficiency of operation, increasing production and reducing maintenance troubles and expense.

Write for further information and examples in specific processes. Ask for Bulletin 96- FM.

NIAGARA BLOWER COMPANY

Over 30 Years of Service in Industrial Air Engineering

405 Lexington Ave. New York 17, N. Y.

Field Engineering Offices in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

angle, and on one-handed jobs in close quarters, it will hold and start the screws. The driver tube acts as a chuck on round and flat screw heads, and the screw is aligned with the driver. Spring mechanism behind the bits forms a flexible connection between screw and hand. The tool is suitable for machine screws, wood screws, and slotted nuts. Eslick Prods., Inc., 1312 Hawthorne Rd., Grosse Pointe Woods 30, Mich.

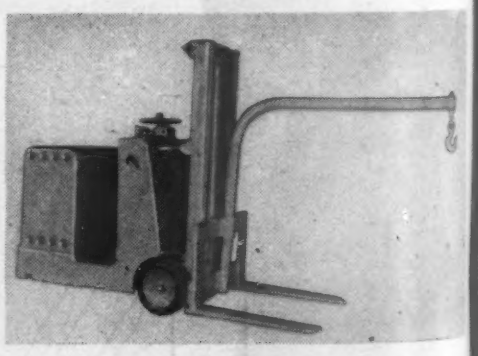
SWIVEL HOOK

Replacement swivel hook assembly with safety latch can be used for cranes and hoists, or lashing applications where safety is required. Comes in ½- and 1-ton capacity sizes. Installed by bolting on — no machining is necessary. A

graphite-impregnated bronze washer under the nut facilitates swivel action, and the heat-treated alloy swivel bolt is built for maximum strength. The Thomas Laughlin Co., Portland 6, Me.

FORK TRUCK CRANE ARM

Crane arm attachment constructed of tubular steel fits maker's power fork



trucks. Lengths range from 24 to 72 inches. Mounted between two forks, it may be operated as a separate unit, or in combination with the forks. Material is picked up with a sling attached to the crane hook. Lewis-Shepard Prods., Inc., 301 Walnut St., Watertown 72, Mass.

PHOTOELECTRIC RELAY

Operating on the modulated light principle, photoelectric relay and light source can be used for counting and limiting, and for protection of restricted

RailMaster 5-Ton MonoRail System saves 31 hours for each car unloaded at this plant.

One man now unloads a car in 5 hours where formerly 3 men took 36 hours.

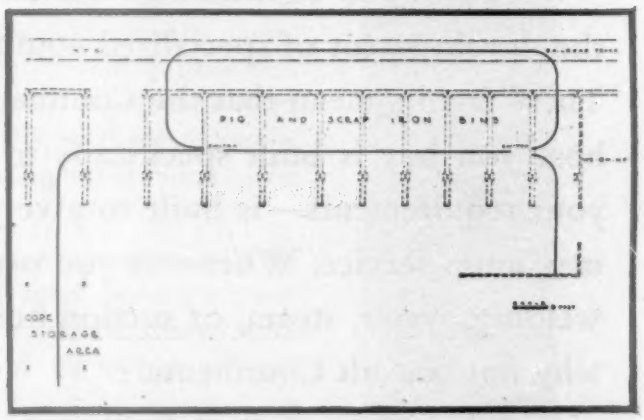
Handling Costs Reduced 86% with AMERICAN MONORAIL

American MonoRail System also used for storing copes and breaking scrap with 1000 lb. steel ball.

At this plant it formerly took 3 men appoximately 36 hours to unload and store a car of pig or scrap iron. With the American MonoRail system one man now accomplishes the same job in 5 hours.

The savings in time is just part of the story since the system is used for breaking scrap as well as storing copes.

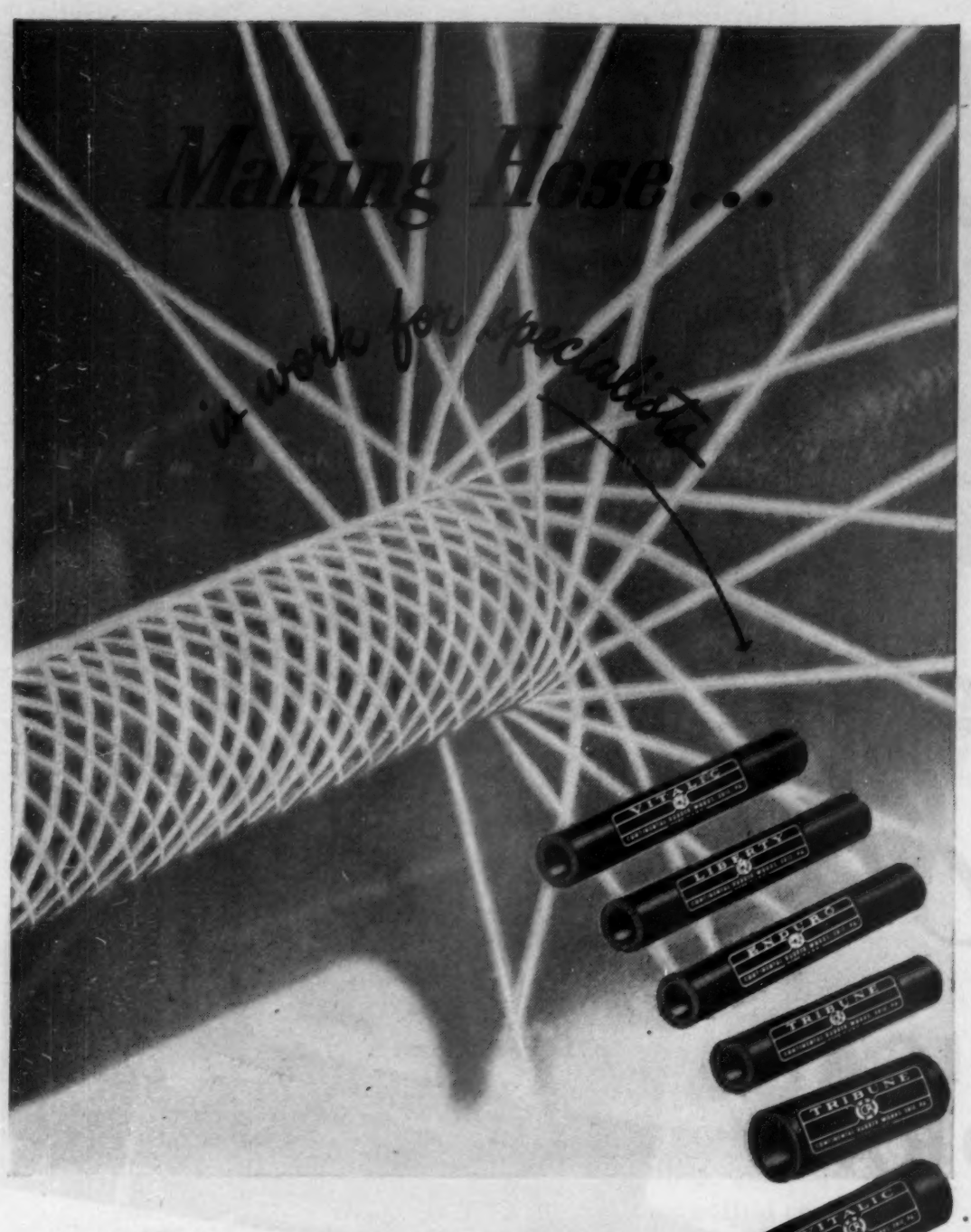
American MonoRail engineers often prove marked reduction in handling costs. They have hundreds of cases from which to draw. A consultation can be quickly arranged.



SEND FOR BULLETIN C-1. A 56-page book showing successful applications of American MonoRail Systems.

THE AMERICAN MONORAIL COMPANY

13114 ATHENS AVENUE CLEVELAND 7, OHIO



Continental's specialization is based not only upon long experience—44 years of it—but also upon continuous research and the development of specialized equipment. These factors mean that the Continental hose you buy is built specifically to meet your requirements—is built to give you maximum service. Whenever you need air, welding, water, steam, or suction hose, why not consult Continental?

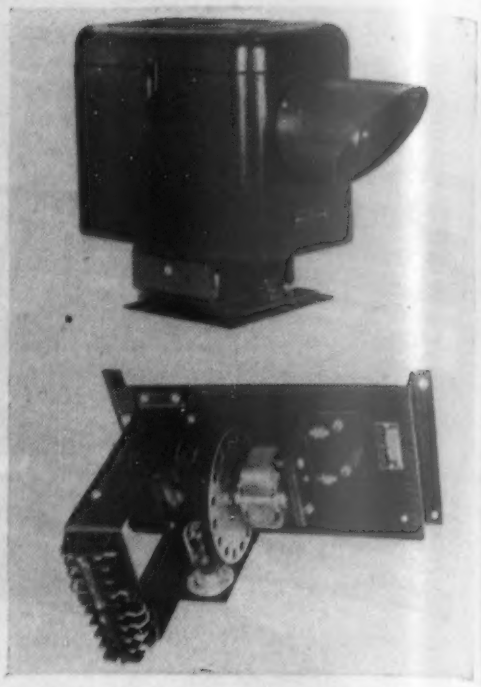
See Our Catalog in Sweet's

Rubber by CONTINENTAL

BRANCHES

Baltimore, Md. Boston, Mass. Buffalo, N. Y. Chicago, Ill. Cincinnati, Ohio Cleveland, Ohio Dallas, Texas
Dayton, Ohio Detroit, Mich. Greensboro, N. C. Hartford, Conn. Indianapolis, Ind.
Kansas City, Mo. Los Angeles, Cal. Lutz, Fla. Memphis, Tenn. Milwaukee, Wis.
New York, N. Y. Philadelphia, Pa. Pittsburgh, Pa. Rochester, N. Y. St. Louis, Mo. San Francisco, Cal. Syracuse, N. Y.

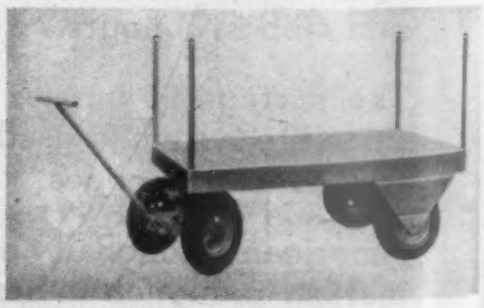
CONTINENTAL RUBBER WORKS • ERIE, PENNA., U.S.A.



locations. Functions at distances up to 1000 feet. Operation is said to be unaffected by rain, fog, or snowfall. The light source contains a lamp, transformer, and motor-driven slotted disk which interrupts, or modulates, the light beam at about 900 cycles per second. Tuned circuit allows the relay to be responsive only to a light beam modulated at this frequency. It is not sensitive to changes in natural or artificial illumination. The units are built in outdoor enclosures equipped with universal mounting. Control Div., General Electric Co., Schenectady 5.

PNEUMATIC-WHEELED TRUCK

Suitable for indoor and outdoor use, on uneven floors, and where quiet operation is desired, pneumatic-wheeled truck can be furnished with attachments for hauling by tractor, truck, or auto. Has 2500-lb. capacity, and is 22 inches high. Furnished with four 16-in. diameter pneumatic wheels with tubes, mounted on roller bearings, the steel truck is 30 inches wide, and has 60-in. length of loading space. Wagon-type, the truck has self-adjusting front axle. The deck is made of one piece, with integral side members and rounded



edges. Steering arrangement consists of a double row ball-bearing fifth wheel. Four sockets for standard 1-in. pipe are provided in the deck, for attachments. The Market Forge Co., 25 Garvey St., Everett, Mass.

HEAVY-DUTY PALLET

Drive Screw Spike Cargo Pallet, Type 10, is a large-size unit for heavy-duty work. It is made of square-edge sound

"Speeder-uppers"

for the production lines

Greater than ever are the variety and volume of parts and products manufactured today from soft ferrous metals and alloys, aluminum, magnesium, copper, brass, plastics, hard rubber and hardwoods.

Files with curved shear-type teeth are the thing for fast roughing, fitting and finishing on work of such materials. But—all curved-tooth file brands are not alike in quality or detail. Differences are so marked that it will pay you to consider carefully the features of these two popular Nicholson designs:

NICHOLSON SUPERIOR CURVED TOOTH

The ultimate in precision-milled files. Teeth are uniformly "razor-sharp."

Tooth radius provides greater shear angle; is also designed to keep two or more teeth in contact with plane-surface work—for smoother cutting, less clogging, eliminating chatter.

Tang is pre-forged, with teeth stopped off to leave a clean shoulder below level of teeth tops—allowing file to be used as a surfacing tool.

Tanged or holed (for use in holder) types. Rigid and flexible styles.

NICHOLSON SUPER-SHEAR

An exclusive Nicholson development. Basically of the curved-tooth file family, the Super-Shear is practically two files in one.

Teeth are milled in an arc that is "off-center" in relation to the axis of the file, affording wide gullets and virtually right-angle teeth extending from one edge—*for fast cutting;* narrower gullets and long shearing angle when nearing other edge—*for smoothing.*

Longitudinal serrations help to break up filings, keep file clear of chips, overcome chatter and tendency of file to run off the work.

The earlier your orders, the earlier the deliveries.
Contact your industrial distributor.

NICHOLSON FILE CO. • 27 ACORN ST., PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE

"Of course he gets more work done—he's got the seat near the General Electric Water Cooler."

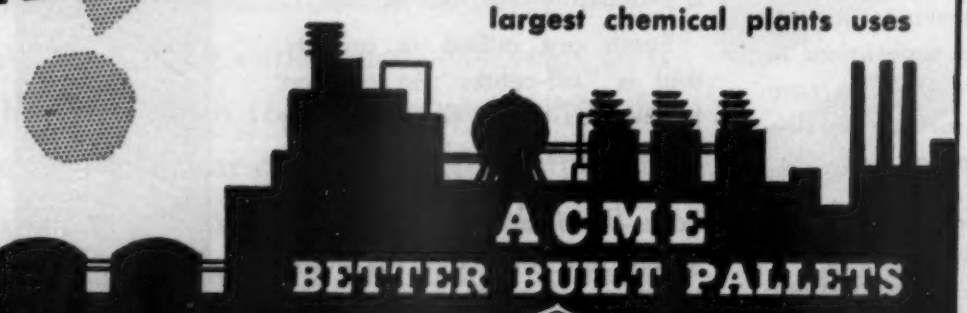
It's true! Employees have more zest for their work when a General Electric Water Cooler keeps them cool and refreshed. And they cost *so* little to operate! Check with your G-E Dealer today. *General Electric Company, Air Conditioning Dept., Section 77211, Bloomfield, N. J.*

GENERAL ELECTRIC

Water Coolers

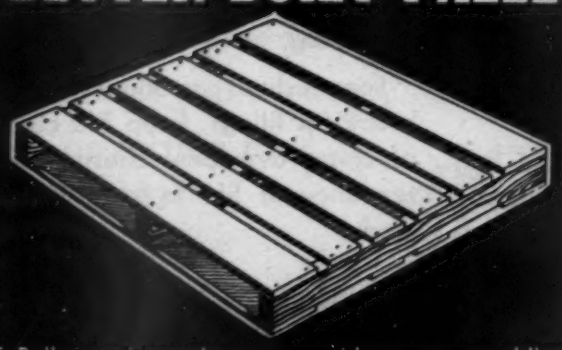
there's a reason

why one of the world's largest chemical plants uses



ACME

BETTER BUILT PALLETS



To select properly engineered pallet designs for your operation write for your copy of THE ACME PALLET HANDBOOK

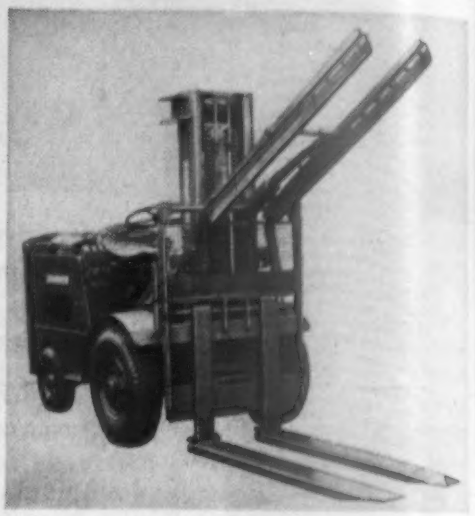
- ACME Pallet engineered systems—without cost or obligation, conserve space, reduce overhead.
- ACME plants are located for prompt, economical service East of the Rocky Mountains.
- ACME Pallets last longer—withstand rough handling.

ACME PALLET CO., Inc. 14 Park Row New York, New York COrtlandt 7-0986

hardwoods, such as oak, maple, beech, birch, and ash. Available dressed on all outside surfaces, or rough. Deck boards are 1-in. thick, and runners are 3x4s. Standard pallet is 48x72 inches, but it may be furnished in other sizes. Acme Pallet Co., Inc., Dept. 22, 15 Park Row, New York 7.

FORK TRUCK CLAMP ARM

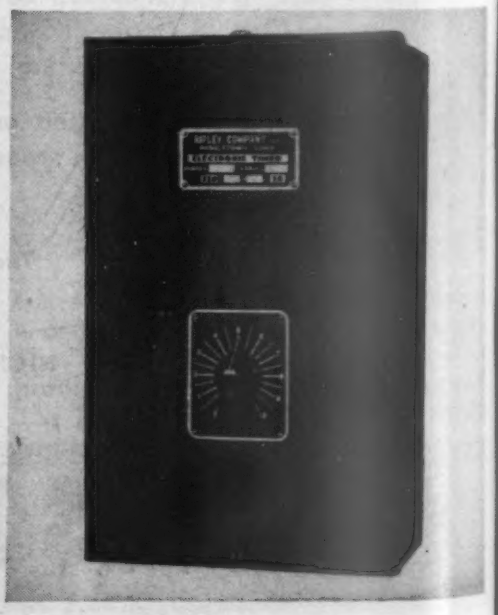
Clamp arm accessory for fork lift trucks prevents large, flat loads from shifting or slipping while being transported or stacked. Consists of a set of hydraulically



operated clamp arms controlled by a valve adjacent to the operator. Equipped with a layer of sponge rubber along the bottom edge, the arms grip the materials being handled without marring or damaging them. Can be used with special adaptations, such as curved arms for cylindrical loads. Towmotor Corp., 1226 East 152nd St., Cleveland 10.

WELDING TIMER

Eliminating guess work in spot welding, Model 52D Timatron electronic timer permits precision control of flow of current in timing the weld. Set for a particular thickness of metal, timing becomes automatic throughout the run. Simple to install, the control can time any spot welder up to 10 k.v.a., and is adjusted on the dial from 0.1 second to 5 seconds by a hand control. Dimensions are 4¾x5⅛x9 inches. Ripley Co., Inc., Middletown, Conn.



Reduces Cost of Machine Base 40% by Change to Welded Steel

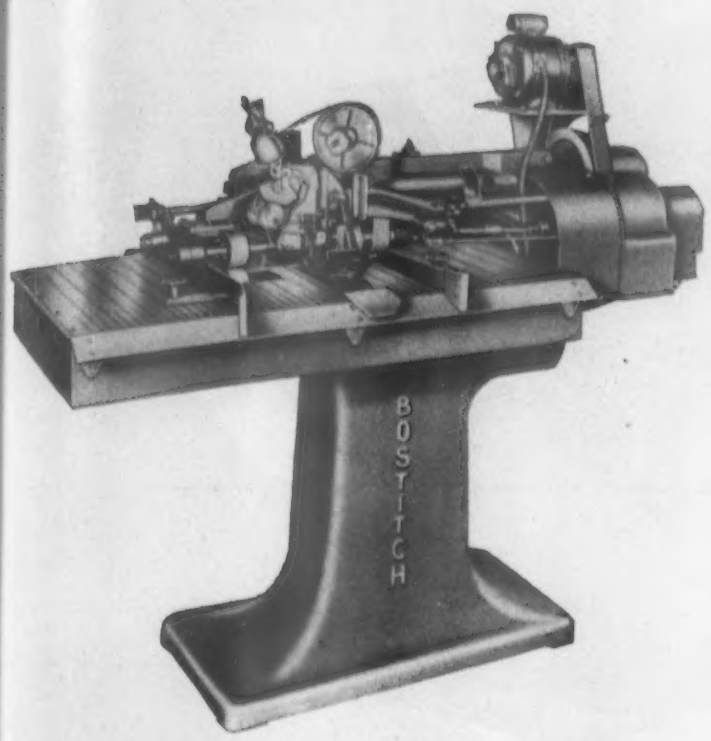


Fig. 1. The Bostitch Stitcher with conventional base.

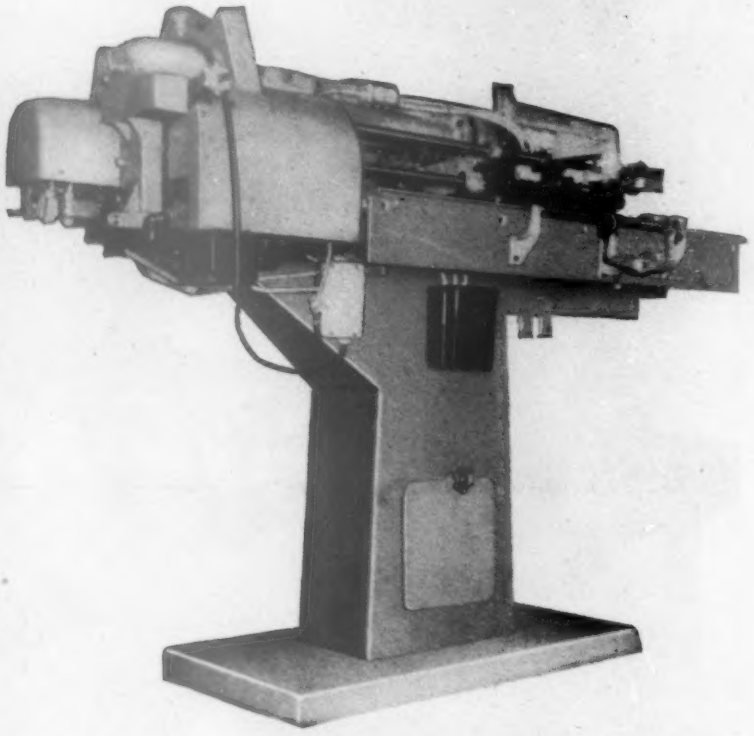


Fig. 2. Rear view of same machine, mounted on new welded base which cost 40% less.

By R. H. Dell, Chief Engineer
Boston Wire Stitcher Company, Westerly, R. I.

CONFRONTED with ever-rising casting costs for the base of the Bostitch Automatic Box Stitcher, we decided to try welded steel design. The result is a base that costs 40% less and is 30% lighter in weight.

Fig. 1 shows the Stitcher with its original base of conventional design, and Fig. 2 shows the same machine, photographed from the opposite side, mounted on the new welded base.

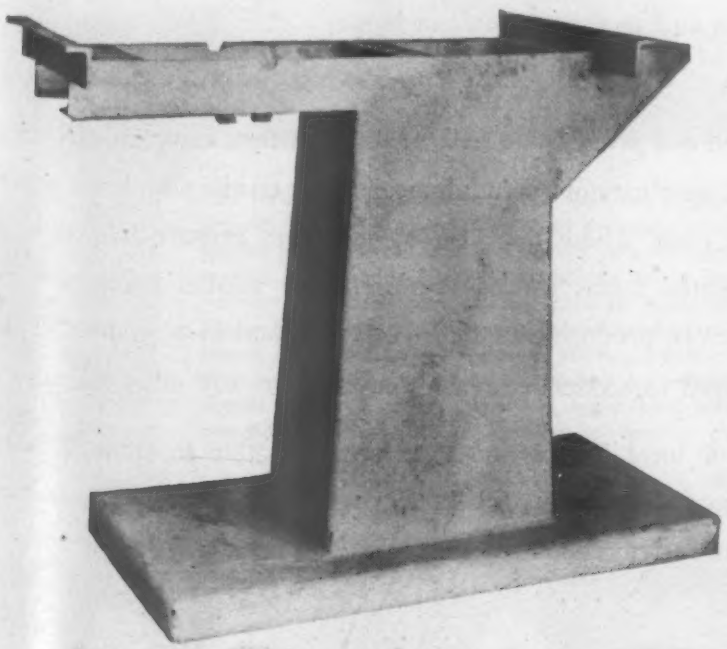


Fig. 3. The welded base without mechanism.

We had been getting the base from an outside foundry and wished to continue having it fabricated outside, so asked commercial welderies for prices on the welded base. This put the former design and the welded design on the same competitive basis.

The lowest bid on the welded base was 40% less than the price we had been paying for the former design. There was also a weight reduction of 30%, the welded base weighing only 525 pounds as compared with the former design's weight of 750 pounds.

Fig. 3 is a close-up of the welded base. The main designing consideration was the great amount of pounding it takes, due to the action of the mechanism in making up to 400 stitches per minute in heavy cardboard containers.

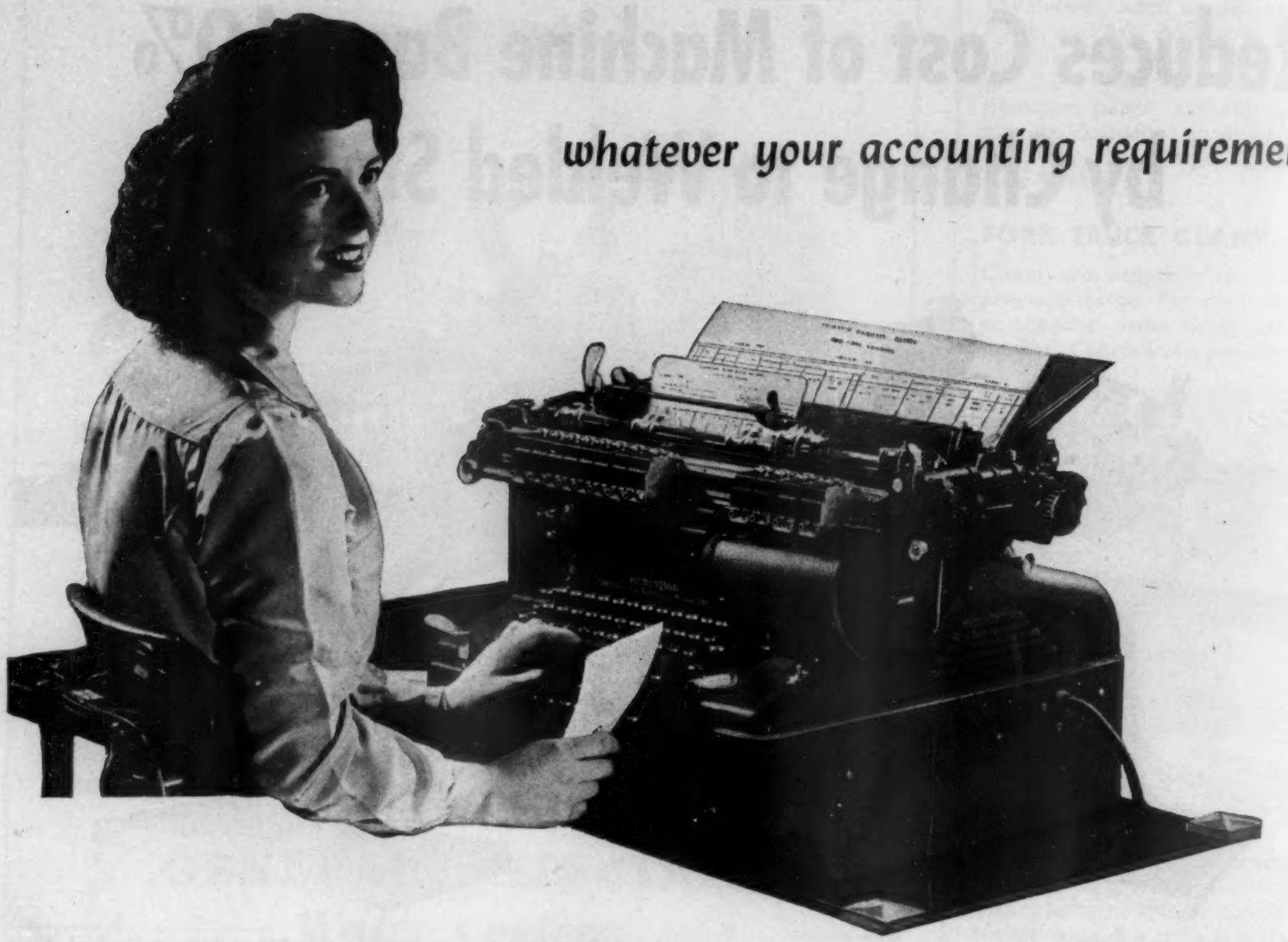
The pedestal, of liberal dimensions to counteract vibration, is one piece of $\frac{5}{16}''$ plate. Corners are notched out, sides bent down and butt-welded at the corners. The column is four pieces of $\frac{5}{16}''$ plate, flame-cut to shape and corner welded. To minimize material at the top of the column, bare angle irons $\frac{3}{8}''$ thick are used for the table mountings. The gusset support had to be extremely strong to absorb the main impact loads, so its top support plate is $1''$ thick and sides and bottom are $\frac{1}{2}''$ plates.

All welds are single pass, square butt welds, not scarfed. "Fleetweld 7" electrode is used.

After changing to the welded base, we discovered an additional market for the same machine with the base $10\frac{1}{2}''$ shorter. To make the adaptation, all we did was cut $10\frac{1}{2}''$ off the bottom of the vertical column before the weldment was assembled. This flexibility of welded design gives us a further advantage.

The above is published by LINCOLN ELECTRIC in the interests of progress. Machine Design Studies are available to engineers and designers. Write The Lincoln Electric Company, Dept. 334, Cleveland 1, Ohio.

whatever your accounting requirements...



Investigate —

Remington Rand BOOKKEEPING MACHINES

Management efficiency implies effective savings in your accounting department, too. Whether your bottleneck is accounts receivable, accounts payable, payrolls, or any other important administrative application, Remington Rand bookkeeping machines will simplify the operation and save you time and money.

Here are a few reasons why. They're fast! Automatic balances, computed *and* printed, interchangeable registers, complete electrification and simplicity of operation mean quick results with lower administrative costs. These bookkeeping machines prepare two, three or more related forms in one operation. For smaller companies, one machine can produce accounts receivable, and in a moment or two be changed to accounts payable, payrolls, or any other record.

Ask your local Remington Rand representative to show you how these machines will materially increase your accounting efficiency. Or write for free booklet "Toast of the Business World".

Free Booklet

Remington Rand Inc.
Adding-Bookkeeping-Calculating Machines Div,
Dept FA, 315 Fourth Ave, New York 10, N Y

Yes! I'd like to know how Remington Rand Bookkeeping Machines increase accounting efficiency. Send me "Toast of the Business World"

NAME _____

ADDRESS _____

CITY _____ STATE _____

Remington Rand

MACHINES FOR MANAGEMENT

COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT

Above: View from above showing two Combination Spray Booth-Dryers for rapid economical painting of Railroad Coaches. Below: Interior of Mahon Combination Spray Booth-Dryer showing workmen spraying on Electrically Operated Scaffold-Elevators.

The finish on your product will take on a greater importance in the near future when the gap between supply and demand narrows down into a buyer's market. Now is the time to safeguard future sales volume by installing modern Finishing Equipment. Regardless of what your product is—railroad coaches, buses, automobiles, refrigerators, stoves, washers or the smallest radio cabinet—the Mahon organization stands ready to plan, engineer, build and install complete ultramodern equipment to handle your cleaning, rust proofing, drying, painting and baking operations efficiently and economically. Mahon Finishing Systems are in operation all over the world . . . twenty-seven years of experience and pioneering development, in this highly specialized field, have endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File, or arrange consultation with Mahon engineers.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT Detroit 11, Michigan • WESTERN SALES DIVISION, Chicago 4, Illinois

Engineers and Manufacturers of Complete Finishing Systems and Many Other Units of Special Production Equipment

MAHON

NO SCRATCHES . . .
LONGER HONE LIFE
with SUPERKOOL *

. . . reports
D. W. DEACON
D. A. Stuart Oil Co.,
Representative

This customer is honing cold drawn steel tubing on a Barnesdrill vertical No. 307 honing machine with a micromatic head. A 120-M Bay State stone removes 30 to 35 thousandths on the I. D. With Stuart's SUPERKOOL* Base mixed 4 to 1 kerosene no tool marks are in evidence, stone life is increased considerably, the finish is excellent and the customer praises SUPERKOOL No. 41* highly.

Douglas N. Deacon

* SUPERKOOL

. . . Stuart's Superkool is a concentrated base cutting oil with high anti-weld capacity and low frictional characteristics. Its light color affords clear visibility on operations where close gaging or constant inspection is necessary. Superkool is chemically stable, sterile, and has no objectionable odor. These are only a few of the reasons why it has been a standard in hundreds of plants for over twenty-five years.

Ask to have a Stuart Service Engineer discuss your cutting fluid requirements. SUPERKOOL Booklet available on request.

STUART *service goes with every barrel*

WRITE FOR DETAILS

D. A. Stuart Oil CO.
EST. 1865 LIMITED

2735 SOUTH TROY STREET, CHICAGO 23, ILL.

YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

SHIPPING CONTAINER in continuous roll. Flexible, corrugated material. Corroflex Tube-Tainer made in 250-ft. rolls. Cut to correct length, insert package, close ends. Sherman Paper Products Corp., Newton Upper Falls 65, Mass.

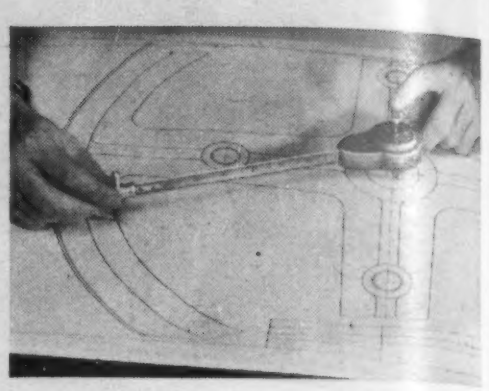
FIRE-FIGHTING AGENT makes water wetter. Surface tension of water reduced by adding 1 per cent of Pentrate. Water spreads, penetrates quickly; gets to heart of stubborn fires. American-La France-Foamite Corp., Elmira, N. Y.

INDICATION DEVICE attached to any industrial instrument senses indication of pointer; converts position into electrical phase angle. No mechanical connection between No Torque Instrument Pickup and instrument. Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica 1, N. Y.

PAINT REMOVER, liquid, non-inflammable, non-toxic. Five-minute immersion in Unisol frees metal, wood, of paint. No heat needed. No fumes. Won't rust metal. Chemco Products Co., Inc., Chicago.

PACKAGING MACHINE net-weighs, fills dry products. Hy-Tra-Lec "C" has 2- to 16-oz. range. Working volume of bucket is 350 cu. in. Continuous feed. Wright's Automatic Machinery Co., Durham, N. C.

INCENTIVE PLAN described in booklet, The Rucker "Share of Production" Plan. It sets forth "a business-like and straight-forward method of sharing with employees, regularly and continuously, a definite and non-arbitrary part of the production values which they help to create, regardless of whether or not the company makes a profit." The Eddy-Rucker-Nickels Co., Harvard Sq., Cambridge 38.

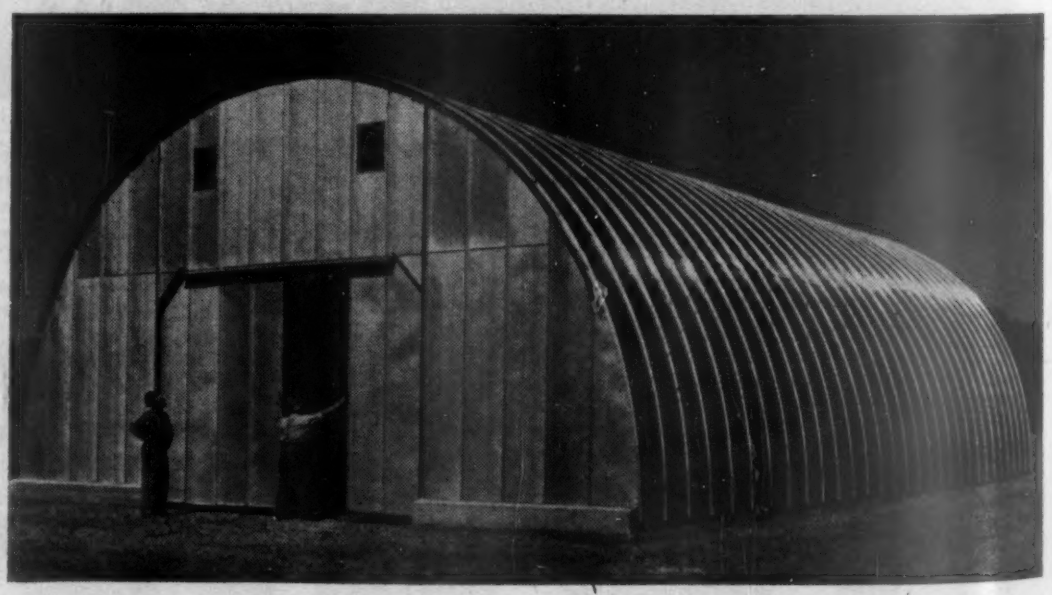


BEAM COMPASS uses retractible steel tape. Radius settings to 72 inches. Brake locks tape at desired radius. Uses either pencil lead or steel scriber. Omicron Co., 532 West Windsor Road, Glendale 4, Calif.

COPY PRINT PAPER, daylight-handling, silver-sensitized. Produces positive copy directly from positive original with normal photographic processing. Kodagraph Autopositive can be used with blueprint or direct-process printers. Eastman Kodak Co., Rochester 4, N. Y.

AMERICAN STANDARDS PRICE LIST, revised. Free. American Standards Association, 70 East 45th St., New York 17.

BOOKLET, "Small Business and the Regulation of Pricing Policies," explains distinctions between legal and illegal practices as defined in Sherman Act, Clayton Act, Robinson-Patman Act, Federal Trade Commission Act, and



PREFABRICATED ALUMINUM BUILDING. Made in 6x36-ft. sections. Standard size, 36x60x19 feet. No interior support posts. Alumi-Drome is erected easily. Requires no paint. Fireproof, termite-proof, ratproof. Can be grounded for lightning protection. Reflects heat. Tentative price, $2975. Reynolds Metals Co., 2500 South Third St., Louisville 1

GET THE *LENGTH* YOU WANT

The Quonset Multiple is built in 20-foot sections to give you as long a building as you need—40', 80', 100', 120', etc.

GET THE *WIDTH* YOU WANT

The two-arch Quonset Multiple is 40' 6" wide. Width can be increased by the addition of as many sections as you want—each section is 20' 6".

GET THE *QUONSET MULTIPLE*

- ALL-STEEL
- FIRE-RESISTANT
- PERMANENT
- NAILABLE STRAN-STEEL FRAMING MEMBERS
- UNIFORM QUALITY OF MATERIALS
- ROT-PROOF
- WARP-PROOF
- TERMITE-PROOF
- LOW INITIAL COST
- LOW UPKEEP COST

If you are looking for a BIG building – one that goes up fast... provides maximum floor space at minimum cost . . . can be easily added to when more space is required – you should get the facts and figures on the all-steel Quonset Multiple. Call your local Quonset dealer or mail the coupon.

YOU NAIL TO STRAN STEEL FRAMING

"QUONSET" TRADE-MARK REG. U.S. PAT. OFF.

GREAT LAKES STEEL CORPORATION

STRAN-STEEL DIVISION, PENOBSCOT BLDG., DETROIT 26, MICH.

UNIT OF NATIONAL STEEL CORPORATION

Great Lakes Steel Corporation
Stran-Steel Division, Dept. 47
Penobscot Building, Detroit 26, Michigan

I should like complete information on the Quonset Multiple for use as warehouse____, fabricating plant____, other use_____.

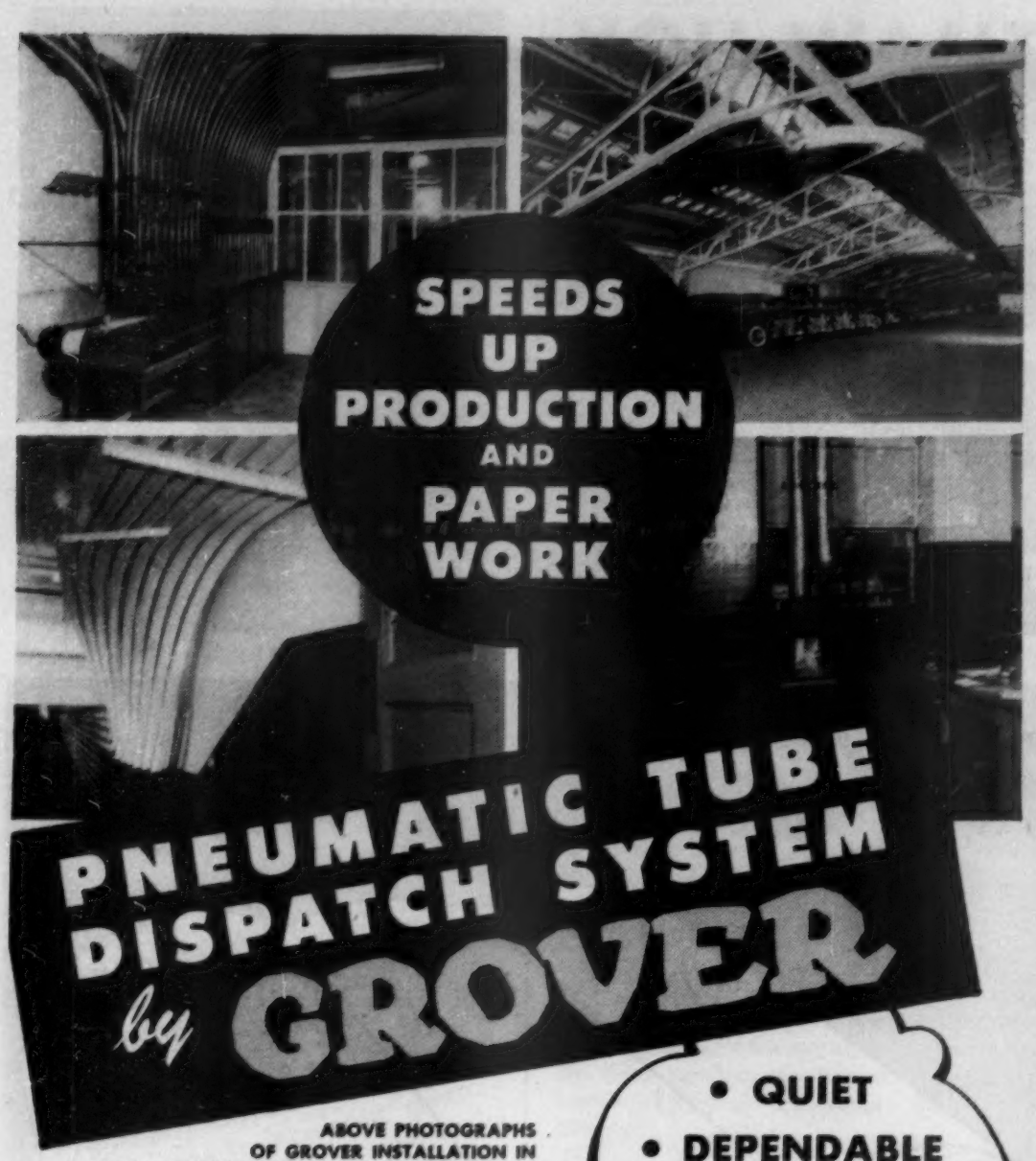
Name_____.

Company_____.

Address_____.

City_____ State_____.

Telephone_____ Extension_____.



ABOVE PHOTOGRAPHS OF GROVER INSTALLATION IN CADILLAC MOTOR CAR PLANT, DETROIT, MICH.

- QUIET
- DEPENDABLE
- ECONOMICAL
- CONVENIENT
- MODERN

Modern mass production technique requires on-the-dot synchronizing of purchasing, delivering, processing and shipping operations. A Grover Pneumatic Tube Dispatch System is the modern way to centralize control. It can do the complete job of keeping the central office in immediate contact with all parts of the plant. This has been proved. Paper work, formulae, small parts, test batches, samples, move rapidly, accurately, privately. Time is saved, errors avoided. The investment is small alongside the many advantages. Ask a skilled Grover representative to look at your plant. There's no obligation.

GROVER

• PNEUMATIC TUBE SYSTEMS •

THE GROVER COMPANY • DETROIT 19, MICHIGAN

Offices in Principal Cities

state "fair trade" and "unfair practices" acts. Department of Commerce, Office of Small Business, Washington 25.

"SOCIAL" ACCOUNTING for public and employee relations. "Short Form" makes financial reports easy to understand. Explodes size-of-profit myth. American Economic Foundation, 295 Madison Ave., New York 17.

SHOP MICROSCOPE for quality control. Combines stereoscopic vision with magnification. Design allows operator to wear safety goggles. Image right side up. Two eyepieces adjust to each user's face. American Optical Co., Southbridge, Mass.

PAPER CUTTER made in 18-, 24-, 30-, 36-, 42-in. cutting widths. No swinging blade. Fingertip pressure operates it. Hobbs Manufacturing Co., 26 Salisbury St., Worcester, Mass.

WARNING DEVICE for railroad side clearance. Cautions employees as train approaches side obstruction. Flexible arms touch man riding side of car. Marshall Ross Co., 53 State St., Boston 9.

ADHESIVE for plastic, metal, rubber, glass, leather, wood, sponge. No. 715 Rubbagrip resists heat, cold, acid, alkali, oil, water. Rubba, Inc., 1015 East 173rd St., New York.

PROTECTOR SLEEVES of plastic for use with acids, caustics, solvents, liquids. Length, 16½ inches. Elastic at each end insures snug fit. Easily cleaned, translucent, dressy, durable. B. F. Goodrich Co., 448 South Main St., Akron.

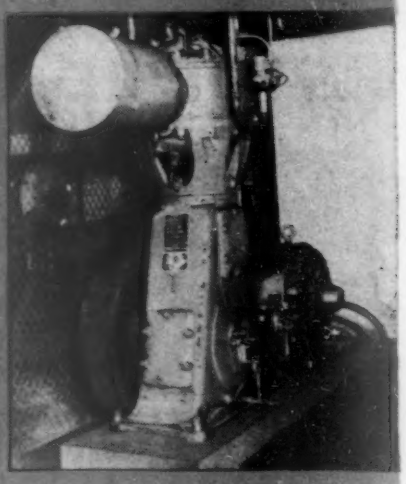
STEEL SHORTAGE described in booklet "The Steel Monopoly and Your Job." Address by Walter P. Reuther, presi-

Easily Installed

WG-9 REQUIRES ONLY A SMALL FOUNDATION TO GIVE TROUBLE-FREE, HEAVY DUTY SERVICE

Vertical, single stage, double acting unit made in 11 cylinder sizes. Features simple block type foundation, full force-feed lubrication, anti-friction main bearings and long life "Dual Cushion" valves.

CYLINDER LINERS REPLACEABLE ON THE JOB



Two examples of compact installations are shown above. Note the simple block type foundations of small area for these Sullivan WG-9 models.

SULLIVAN

AIR COMPRESSORS

¼ to 600 H. P.

3 to 3656 C. F. M.

W&D I 1310

Consult a Joy Engineer or write for Bulletin T-9

SULLIVAN DIVISION

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH, 22 PA.

...YOU'RE SURE OF HIGH QUALITY LOW-COST VALVE SERVICE

With Lunkenheimer Valves in the line . . . you get better valve service . . . every time. That's the considered opinion of engineers and operating men throughout the nation. From long experience, they know that Lunkenheimer Valves give **extra** years of **better** service, set new low records for over-all valve cost.

Lunkenheimer leadership in engineering and design, valve metallurgy and craftsmanship has been established over many years . . . protected by rigidly enforced standards of highest quality . . . recognized by valve users in practically every industry. When buying valves, the Lunkenheimer name is your assurance of full service . . . complete satisfaction. The Lunkenheimer Company, Cincinnati 14, Ohio, U.S.A. New York 13, Chicago 6, Boston 10, Philadelphia 34. Export Department: 318-322 Hudson Street, New York 13, N. Y.

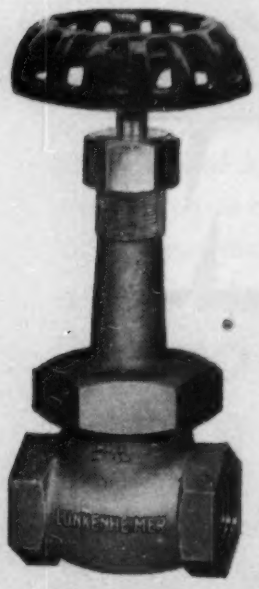


Fig. 2228
200 lb. Bronze
Union Bonnet Gate

AN ADEQUATE STOCK...

...close at hand

A big stock is not enough. Lunkenheimer Distributor stocks are carefully geared to the particular needs of each territory. This "planning ahead," plus your Distributor's aid in solving operating and maintenance problems, rapid delivery service . . . are the reasons why so many plants rely on their Lunkenheimer Distributors for complete valve service.

LUNKENHEIMER VALVES

dent, UAW-CIO. United Automobile, Aircraft, and Agricultural Implement Workers of America (UAW-CIO), 411 West Milwaukee, Detroit 2.

PROTECTIVE COATING for metal, glass. Transparent, flexible plastic. Thermo-Dip N.S. is resistant to salt water, humidity, low temperature, shock, abrasion. Eronel Industries, 5714 West Rico Blvd., Los Angeles.

PAINT made from water dispersion of synthetic resin. Odorless, non-toxic, dries in half-hour. Resistant to weather and wear. All colors. For wood, metal, brick, plaster, wallboard. Foster D. Snell, Inc., 29 West 15th St., New York.

VENDING MACHINE holds 300 six-ounce cans of refrigerated fruit and vegetable juices. Opener kept at 180 deg. F. for sanitary purposes. Built-in waste dispenser. Telecoin Corp., 12 East 44th St., New York

FILM SERVICE with library of 10,000 industrial films. Half-hour programs of selected short subjects for employee recreation. United World Films, Inc., 445 Park Ave., New York.

FILMS

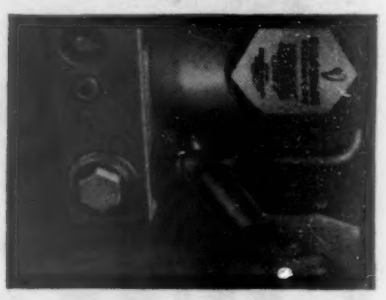
Round Trip: The U.S.A. in World Trade states that the people of the United States are paying out billions of dollars extra a year for goods which could be produced more efficiently and cheaply abroad. Two-reel documentary in 16mm. size. Twentieth Century Fund, 330 West 42d St., New York 18.

Crossroads of America, 30-minute, 16-mm. film answer to pro-communist, anti-business movie, "Deadline for Action," sponsored nationally last year by United Electrical Workers Union, CIO. "Crossroads" shows how communist operates, what he's after; gives facts of how our economy works, what it has achieved. The Research Institute of America, Inc., 292 Madison Ave., New York 17.

New...built for industry

An *Exclusive* combination of Benefits are now Created for You by These New Heavy-Duty Jacks!

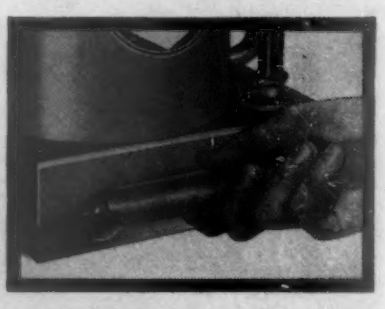
PATENTED DOUBLE PUMP—all in ONE unit! Speed pump provides fast load-contact—powerful load pump cuts in automatically! No shifting handle or double-yoking as with separate pumps.



ALL-DIRECTIONAL OPERATION—Full power and travel at any angle, vertical to horizontal. Handle forms positive side-rest for horizontal use.

GAUGE EQUIPPED — Base is tapped for hook-up of gauge to show amount of pressure exerted — for measuring or testing applications.

PUMP BEAM PROTECTION is provided by handle and base. Pump is concealed. Beam is protectively enclosed at entry point to base.



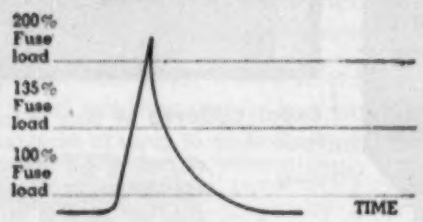
SUPER STRONG BASE—machined from single piece of non-porous steel. Release valve is recessed to prevent accidental lowering and breakage.

CHECK these cost-saving features of the New 30-ton FB-11 and the 50-ton GB-11. They bring you outstanding new jack performance never before known in industry. (Other Blackhawk models include 3, 5, 8, 12, and 20-ton sizes.) See your Blackhawk Industrial Supply Distributor for full information on these new Jacks.

A Product of **BLACKHAWK MFG. COMPANY, Dept. J27117 Milwaukee 1, Wisconsin**

Always Specify

BLACKHAWK
HYDRAULIC JACKS

STOP
UNNECESSARY
FUSE
BLOWING
INSTALL
PIERCE
Balanced Lag
RENEWABLE FUSES
Exclusive Features, developed by Pierce engineers, dissipate heat by:
1. Link Design
2. Screen Ventilation
Typical High overload surge


NOTE: The elapsed time at 200% fuse load is a few seconds, but at 135% load may be many minutes.
Pierce Balanced Lag fuses concentrate additional lag in the safe overload range, from 100% to 200% load, where lag is needed to prevent unnecessary fuse blows.
FREE: Balanced Lag Link to inspect and test. Specify amperage, voltage.

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer on Government Regulations, New York University, and a Member of the New York Bar

Period Surveyed: September 1 to October 1

TREND INDICATORS
Wage-Hour

EMPLOYER'S DUTY TO GRANT PATTERN INCREASE

An employer may not deny his employees a pattern increase granted by his competitors on the ground that his per capita output is far below the output of his major competitors. The efficiency and output of the employees is largely under the control of the company. It was the arbitrator's opinion that the company, as well as the employees, would be benefited by the extension of the incentive system to the entire working force, which system should put the company on a reasonable competitive basis as to production costs.
(In re arbitration between Watson Elevator Company, Inc., and United Electrical, Radio, and Machine Workers of America)

HELD NOT EXEMPT

An employee engaged as a tabulating machine operator and later as a head personnel clerk in a divisional office is not an exempt administrative employee under the Fair Labor Standards Act, despite the fact that the employee receives over $225 a month. In the position of head personnel clerk, the employee's duties were varied. He had charge of preparing the payroll checks with the aid of the tabulating machine, based on the time sheets sent to him; of delivering these checks to the office manager for signature; and of assorting them for mailing to the particular area office where they were delivered to the various individual employees. The employee also had charge of keeping the office personnel records. This required him to confer with his superiors and to contact the various departments of his divisional office as well as the head office of the company. A typist and filing clerk were assigned to work directly for him. The employee had no authority of his own either to hire or discharge employees, but he was expected to, and did make, recommendations relating thereto. The major portion of the employee's time was consumed in the preparation of payroll checks, personnel records, and reports, apart from time spent in the actual operation of the tabulating machine, which was approximately 25 per cent.

"The extent to which discretion or independent judgment, and the duty of making recommendations are involved, is one of the most important elements in determining whether a person's work is of an administrative character. In other words, the differentiation between a mere clerk and one with actual administrative ability may be said to be very largely in. (1) the exercise of discretion and independent judgment, and (2) in receipt of a salary that is above that customarily paid to one engaged primarily in manual or clerical work."

The employee, in this case, was not required to exercise discretion and independent judgment. About 90 per cent of his work was manual in character.
(Donovan v. Shell Oil Company, Inc.; USDC Maryland)

NOT PRODUCTION OF GOODS FOR INTERSTATE COMMERCE

Employees engaged in drilling for oil, in which no such product in commercial quantities is found, are not engaged in production of goods for interstate commerce. If no goods come into existence which may be shipped, the purpose of the Fair Labor Standards Act, which is "to prohibit the shipment of goods in interstate commerce if they are produced under substandard labor conditions," wholly fails. Labor employed in a search for or exploration of minerals does not come within the Act if the search or exploration is futile and no minerals in commercial quantities are found. In case of such failure, no goods come into existence; there is nothing to sell; nothing to trade; nothing to transport. By no possible stretch of the imagination is there any relationship between such labor and commerce. The term "production for interstate commerce" necessarily implies production of something tangible, capable of being made the subject of such commerce. It means more than mere hope of, or attempt at, production. Production connotes the creation of something.
(Atwater v, Gaylord; Wyoming Supreme Court)

HOURLY RATE OF PAY FOR PIECEWORK EMPLOYEES

Piecework earnings must be divided by the number of hours worked in order to arrive at the statutory regular hourly rate of pay upon the basis of which an employer must pay overtime to his employees who received one hour's pay for each head of cattle slaughtered.

To enable the employees to increase their wages, and as an incentive to produce more, it was agreed to give them one hour's pay for each head of cattle. If they handled one head an hour, they

WAX YOUR FLOORS *Electrically* . . . AND SAVE!

Waxing floors electrically—*The Finnell Hot Wax Process*—is much more than a time-saving method of applying solid wax. Hot waxing affords greater penetration—allows the wax to *flow* into the pores of the floor—and thoroughly utilizes the wax solids. *Hot waxing with Finnell-Kote,* whose genuine wax content is three to four times greater than average wax, produces a finish unique in wearing and protective qualities, and hence is more economical on a year-to-year cost basis.

Finnell-Kote is heated in a *Finnell-Kote Dispenser* attached to a *Finnell* machine. The melted wax is fed to the floor through the center of the brush ring, and is uniformly and rapidly spread by the revolving brushes. *Sets in less than ten seconds,* and polishes to a beautiful, non-skid finish that actually *seals* out dirt and grime. *Finnell-Kote* is specially processed for heavy traffic areas . . . contains genuine Carnauba. Can be used on all types of flooring except rubber and asphalt tile.

Finnell makes a complete line of Waxes, Water Emulsion as well as Spirit Waxes . . . also a full line of Cleansers and Sealers . . . and Floor-Maintenance Machines and Accessories for every type of floor care.

For consultation or literature, phone or write nearest *Finnell* branch or Finnell System, Inc., 2511 East Street, Elkhart, Indiana. Canadian Office: Ottawa, Ontario.

THE *Finnell* HOT WAX PROCESS

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

MECHANICAL HANDLING SYSTEMS, INC...
DETROIT, MICHIGAN

Selects ROSS

To solve one of their own handling problems, this manufacturer of material-handling equipment selected a *ROSS* five-ton pneumatic tired *LIFT TRUCK*. Subsequent experience has more than justified this choice . . . For efficient all-weather handling of big, bulky loads on dirt, cinder or paved roads, *ROSS* insures you uninterrupted service. Six models, capacities, 5,000 to 18,000 lbs., hydraulic hoist, gasoline powered.

Rely On ROSS

THE ROSS CARRIER CO.
295 MILLER STREET, BENTON HARBOR, MICHIGAN, U.S.A.
Direct Factory Branches and Distributors Throughout the World

received one hour's pay, two head per hour, two hour's pay. If they handled more than eight head of cattle in any one day they were paid time and one-half the hourly rate even if they did not work overtime hours in the day; and they received this overtime pay even if they did not work more than 40 hours in any week.

In the instant case, the actual basis of compensation was the number of cattle slaughtered rather than the number of hours worked. The employees were paid on the basis of one hour's pay, regardless of the time it took to slaughter that head of cattle. When an employee slaughtered twelve cattle in eight hours, his wage was not based on the number of hours he worked. This was actually piecework production. The hourly rate should be the piecework earnings divided by the number of hours worked. The fact that the piecework rates were based upon the hourly rate that was theretofore in effect does not convert the piecework production into hourly employment. The payment of wages to employees without regard to the actual overtime worked, but based upon piecework rates, violated the Wage-Hour Law. (Selan v. Becker; USDC E. Wisconsin)

NOT ENGAGED IN INTERSTATE COMMERCE

An employee engaged as tabulating machine operator and personnel clerk in a divisional office maintained for marketing a petroleum company's products in several states was not engaged in interstate commerce within coverage of the Act, since his work had no connection with the actual movement of the company's products from one state to another. No goods were produced or refined by the company in the state in which the office was located, and no refining processes were carried on, either directly or indirectly, by any one in the divisional office. This office was concerned exclusively with sale and distribution of the company's product within a designated territory.

Although the nature of the employee's work does not exempt him from the Act, he is not eligible to recover overtime where he failed to prove either (1) that he was engaged in interstate commerce while employed by the company, or that his activities were so closely related to the movement of goods in such commerce as to be an essential part of it, or (2) that he was engaged, while employed by the company, in the production of goods for interstate commerce or that he had a close and immediate connection with any process necessary to the production of goods for such commerce. The employee has the burden of proving that his work meets one of the above descriptions. In either case, however, the applicability of the Act depends upon the character of the actual work done by the particular employee rather than upon the nature of the employer's business as such.

In this case, it is clear that the employee's work had no connection with the actual movement from one state to another of the company's petroleum

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS STEEL MILLS — Special Electric Furnace Steels

SIMONDS ABRASIVE CO. — Grinding Wheels and Grains

SIMONDS CANADA SAW CO. LTD. — Simonds Products for Canada

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

SECRET of straighter, smoother cuts and longer blade-life is ACCURATELY TESTED TENSION.

NEW SIMONDS *SIMOMETER* enables you to tension any size blade correctly in a matter of seconds . . . and so get top cutting performance out of the top brand of blades — SIMONDS "Red End".

SEE HOW *SIMOMETER* SAVES SAW-DOLLARS! A Simonds Saw Specialist will demonstrate — on your own hacksaw machines — this easy-to-read tension tester. NO OTHER METHOD LIKE IT. Just call your distributor or the nearest Simonds office.

How "HEAD TO FOOT" PROTECTION works for you

The Utility Acid Suit and Fisher Rain Suit are typical examples of Rainfair full-protection work clothing . . . made with BUNA-S for long, heavy-duty service.

• One easy way to put an up-swing in the production curve is to eliminate work stoppages and delays due to "wetwork" accidents and illness. On jobs involving splash hazards or excessive dampness, outfit your employees in Rainfair-Vulcanized Work Clothing . . . safeguard against acid, alkali and water. Rainfair garments are styled for comfort, designed for safety, and engineered for lasting service. Write today for catalog and name of distributor.

A GARMENT FOR EVERY INDUSTRIAL NEED

Rainfair All-Purpose Raincoats are made from sturdy, rubberized fabrics. Specially designed with heavy-duty fasteners, patch pockets with flap. Most models have corduroy-tipped collars, vented back.

Rainfair Industrial Aprons are acid, alkali, oil and waterproof. They're made from double-coated fabric . . . have cemented and vulcanized hem that will not open up. For heavy-duty work, long service.

RAINFAIR INCORPORATED
DEPT. 27-L • RACINE, WISCONSIN

RAINFAIR
VULCANIZED
WATERPROOF WORK CLOTHING

products. With respect to production of goods for interstate commerce, its business at the division office is confined to selling and distributing, at wholesale, its gasoline and other petroleum products. "The Act may not properly be construed as applying to work that only indirectly affects the sale or distribution of goods in interstate commerce, and that has no connection whatsoever with production of such goods, other than in the sense that sales and distribution are very remotely related to production." (Donovan v. Shell Oil Company, Inc.; USDC Maryland)

LABOR-MANAGEMENT RELATIONS

*EMPLOYER'S RIGHT TO DISCHARGE FOR LACK OF APPLICATION

An employer has the right to discharge a building superintendent whose laxity and lack of application to his job have contributed to neglected and unhealthful conditions of the apartment buildings. Although the job *per se* was entitled to an increase, the arbitrator could not justify an increase where the employee involved was not performing his work. The employer may therefore discharge the present incumbent, but not for a period of 90 days, unless he finds another job sooner. The arbitrator recommended that at the end of the 90 day period, the employer hire a replacement from the union, at which time a suitable wage increase should be negotiated. (In re arbitration between Faton Realty Corporation and Building Service Employees' International Union)

*EMPLOYER'S RIGHT TO DISCHARGE WITHOUT GIVING PRIOR NOTICE TO UNION

Despite a contract clause giving the union the right to take up with the employer's representatives "any matter arising from the application of this agreement," an employer is not required to notify the union of contemplated discharges, or to consult with the union prior to making discharges. The employer is expressly given the prerogative in another part of the contract to determine the number of employees required to publish the newspaper, and is under obligation only to notify the employee at least two weeks in advance of any contemplated discharge. The arbitrator could find nothing in the agreement which required consultation between the employer and the union, prior to the employer exercising his prerogative of determining the number of employees it will require. Nor is there anything in any other part of the agreement from which an obligation to give the union such prior notice may be assumed.

However, under one contract clause, the employer has an affirmative duty to give appropriate notice to the individual employee of any contemplated discharge. By giving such notice to the employee,

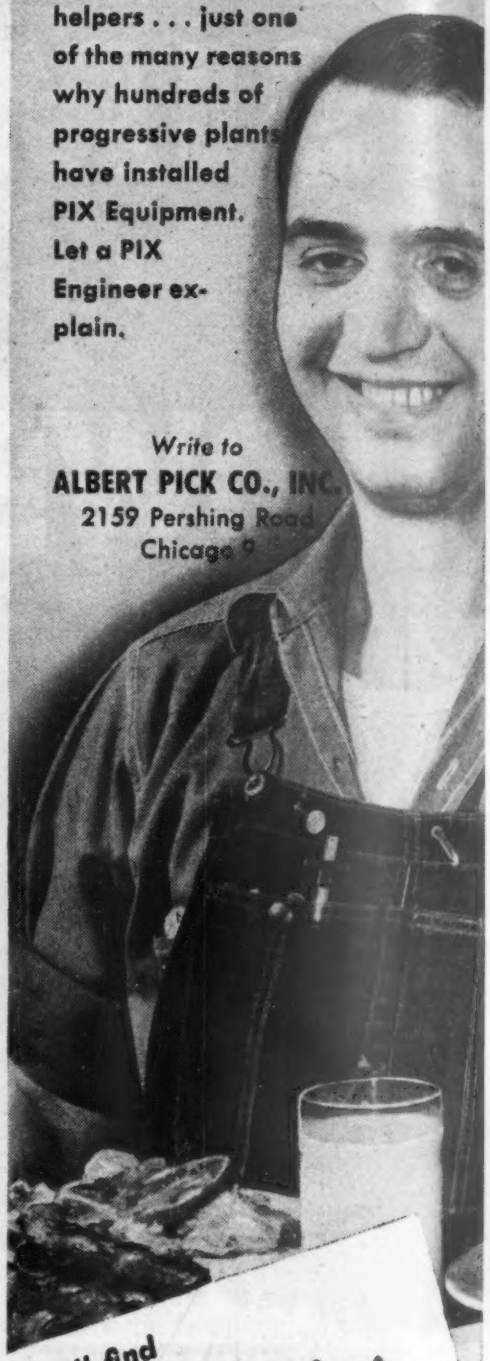
*In this classification, items marked with an asterisk also are considered to be trend indicators.

IT CUTS DOWN ABSENTEEISM!

Just one of the many reasons why you need good food service in your plant.

PIX EQUIPMENT

Is geared for fast, efficient food service . . . serves more workers faster with fewer helpers . . . just one of the many reasons why hundreds of progressive plants have installed PIX Equipment. Let a PIX Engineer explain.



Write to
ALBERT PICK CO., INC.
2159 Pershing Road
Chicago 9

You'll find
Cafeterias by PICK
IN AMERICA'S LEADING PLANTS
MARS, INC. FORMFIT COMPANY
NATIONAL SCREW & MANUFACTURING CO.
EKCO PRODUCTS COMPANY ARMOUR & CO.
CRONAME, INC. AND MANY OTHERS

Professional Worriers!

Every business, time and again, runs into production snags. When the problem is *lubrication*, we're often called in to do the worrying. And eight times out of ten we come up with the right answer—*fast*. Because that's our job day in, day out, year after year—putting petroleum to work *efficiently*. This backlog of experience, coupled with the world's finest lubricants and fuels, is your best reason for calling Cities Service next time trouble calls on you.

CITIES SERVICE STOPPED TROUBLE HERE!

A screw products company in Cuyahoga Falls, Ohio, called on Cities Service for advice on machining a part of an intricate mechanism made of aluminum that required extreme accuracy and finish. Chillo Oil No. 22 was recommended. Thereafter, the manufacturer reported the machined work was not only well within the required tolerances, but the work had a mirror-like finish. Tool life was also phenomenally good.

A brick and tile company in Iowa suffered numerous failures of the main drive-shaft bearings in their Hammer Mill Crushers. Cities Service engineers recommended Pacemaker Oil No. 2. The last report from the company said that since they standardized on this lubricant, no bearing failures have occurred.

"We use Solvent No. 26 for cleaning surplus oil and grease out of electric clock movements and we find it unexcelled for this purpose" ...so writes the president of an Illinois watch repairing and rebuilding concern after continued use of this remarkable new Cities Service metal cleaning fluid.

A bus company executive in Cleveland, Ohio, recently said, "During the past four years, we used Cities Service Heavy Duty type oil with outstanding results—minimum wear, freedom from sludge and no engine failures—which has enabled us to give uninterrupted service to our customers."

Cities Service Oil Company
Room 249 Sixty Wall Tower
New York 5, N. Y.

Gentlemen: I have a production problem that involves lubrication. I would like to discuss it with one of your lubrication engineers, without obligation, of course.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

CITIES SERVICE OIL CO.
New York—Chicago

CITIES SERVICE

ARKANSAS FUEL OIL CO.
Shreveport, La.

Reduce LABOR Costs

Increase material handling efficiency

with DRACCO PNEUMATIC CONVEYORS

Material handling costs can be reduced in many plants. DRACCO Pneumatic Conveyors move chemicals, grains and granular materials with a minimum of manual labor — ONE man and a DRACCO Pneumatic Conveyor invariably replaces SEVERAL men. Materials are moved more efficiently and cheaper — with fewer man hours. Why not let DRACCO Engineers check your present material handling methods with a view of recommending a BETTER method requiring LESS labor. They have over 30 years of experience in material handling.

For Further Information Write

DRACCO CORPORATION

4091 E. 116th St., Cleveland 5, Ohio *New York Office:* 130 W. 42nd St.

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

the union, as his representative, ordinarily would be in a position to take the matter up with the employer. The arbitrator pointed out that only in this manner will full meaning be given to all of the clauses contained in the agreement. "To find otherwise would be tantamount to disregarding one or another of the contract clauses, or to giving unequal weight to one clause over another, something earnestly to be avoided."

(In re arbitration between New York Tribune, Inc., and American Newspaper Guild)

*FILING OF NON-COMMUNIST AFFIDAVIT PREREQUISITE TO USE OF BOARD

The provision of the Labor-Management Relations Act of 1947 requiring each officer of a labor organization, and officers of any national or international labor organization of which it is an affiliate or constituent unit, to file a non-communist affidavit as a prerequisite to use of the Board's facilities must be complied with. Therefore, a union which is affiliated with another organization which has not filed the necessary affidavit is not entitled to a mandatory injunction for the purpose of directing the National Labor Relations Board director to count ballots cast in a representation election.

The court pointed out that the close point in this case is whether or not this company or the union can be bound or should be bound by the action of its affiliate. The AFL and the CIO are made up of constituent units. The policy of the CIO is shaped by the joint action of its several units. "They are, therefore, affiliated in a sense that they are a part of it, and since they make up the voice of policy of the CIO, the CIO in turn must of necessity have its influence on the policies of its affiliates. It is the natural thing for them to do in order to secure the most effective results."

The fact was brought out that the question might be insisted upon that Congress has no right to interfere in these matters by reason of a man's belief. The powers of Congress which are outlined and defined by the Constitution provide that the national government shall guarantee to each state a republican form of government. Therefore, the national government may curb the growth of any system that would destroy representative government and bring about government by force.

Since the evidence disclosed that the union is an affiliate of an organization that has not yet compiled with the provisions of the law, the court would not grant a petition.

(Oil Workers v. Elliott; USDC N. Texas)

*DISCHARGE OF EMPLOYEES FOR FAILURE TO MEET PRODUCTION STANDARDS

To hold that the failure of long-term employees to meet production standard, because of age, is a proper cause for discharge would be going against the entire intent and spirit of seniority clauses. Therefore, in the absence of a specific contract provision conditioning employment upon the meeting of certain

For efficiency in Welder Controls...

...replace with RCA Electron Tubes

The RCA line of thyratron and ignitron tubes meet all major welder-control requirements. They are directly interchangeable with other standard types.

RCA thyratrons and ignitrons embody the ruggedness, high quality, and long service life that should be expected from tubes designed expressly for continuous-duty applications in industrial service. That is why you can count on *all* RCA industrial electron tubes to give top efficiency.

In addition to its representative line of thyratrons and ignitrons, RCA has a large and growing family of industrial electron tubes of which there are over 200 *standard* types. Included in this group is a complete line of high-vacuum and mercury-vapor rectifiers for high- and low-voltage applications, power amplifiers for electronic heating equipment, cathode-ray tubes, and the most complete line of phototubes in the field.

When you need renewal tubes, look to RCA.

Free

QUICK-SELECTION GUIDES

Radio Corporation of America
Commercial Engineering
Section T-46-K, Harrison, N. J.

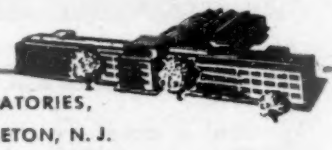
Please send me Bulletin PG-101 giving technical data on RCA Power and Gas Tubes for Radio and Industry, and Bulletin 2-F19-R3 covering prices and interchangeability by type numbers of the complete line of RCA industrial electron tubes.

Name_____

Street Address_____

City_____

Zone_____ State_____



RCA LABORATORIES,
PRINCETON, N. J.

IN RADIO AND ELECTRONICS—*THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA*

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

SOUND POWERED TELEPHONES

WITHOUT BATTERIES OR OUTSIDE POWER SUPPLY

UNITED STATES INSTRUMENT CORPORATION
SUMMIT NEW JERSEY

This is how STROM BALLS are born

A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape.

The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of Industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

Strom BALLS Serve Industry

Largest Independent and Exclusive Metal Ball Manufacturer

production standards, long-service employees may not be discharged for failure to meet production standards. The arbitrator suggested that it would be worthwhile for both the union and the company to agree upon a certain minimum standard of performance and production for all workers, or for those in the advanced age brackets to meet, or it may be possible to work out some special classification for such workers.
(In re arbitration between Dodge Cork Company and United Rubber, Cork, Linoleum, and Plastic Workers of America)

***GRIEVANCE COMMITTEE IS A LABOR ORGANIZATION**

A grievance committee, comprised of employees selected from each area to represent the remaining employees in the area in dealing with the company concerning grievances of the employees, was a labor organization within the meaning of the Act. Each committee designated one member as chairman, the committeemen held office for 90 days with the right of reelection, and the committees met weekly with management. The Board found that the grievance committee had all the attributes and characteristics of, and was, an employee representation committee for the purpose of dealing with the company concerning employee grievances.
(Reynolds Corporation and United Steelworkers of America; NLRB)

***ILLEGAL STRIKE TERMINATES CONTRACT**

When a union violated the no-strike provision of the contract, it also forfeited its other rights under the contract. One party cannot deliberately violate the terms of a contractual obligation and then attempt to hold the other party to its terms.

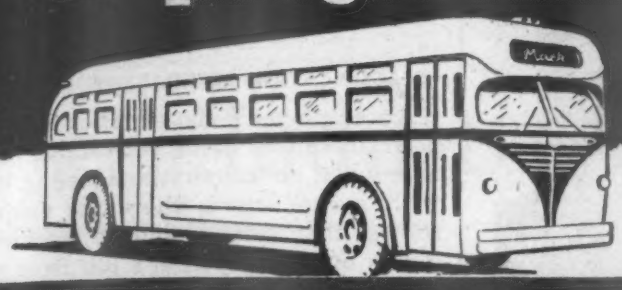
Since the contract between the company and the union was breached by the union's calling a strike in violation of the agreement, there is no obligation of the company to pay for vacation time during the strike.

The obligation not to call a strike during the period of the contract is undoubtedly one of the major provisions of the agreement.
(In re arbitration between Perley A. Thomas Car Works and United Automobile, Aircraft, and Agricultural Implement Workers of America)

***ABILITY TO PAY NOT A CONTROLLING FACTOR**

A company's ability to pay should not be a controlling factor in their determination of base wages necessary to pay all employees a minimum wage rate, and to provide them with working conditions that will enable them to live in decency and in health in accordance with American standards of living. However, in determining any additional compensation or betterments of working conditions, such as shortened work periods, spread-time penalties, night-work differentials, minimum guaranteed hours, vacation and separation pay, pensions, sick benefits, life insurance, and

"Prevents costly interruptions of progressive assembly"



...says MACK Mfg. Corp.

Digest of James O. Peck Co. report, another of the independent studies of assembly savings made with Phillips Recessed Head Screws in leading plants.

Power drivers are "puncture-proof" despite the thin, sheet aluminum panels, because of the "engineered fit" of the Phillips Driver Bit in the Phillips Recess. No skids! No burred heads!

"Trim" is the word for the way the Phillips Recessed Heads dress up the modern bus interior. But the advantage is more than just appearance: idle-handed passengers are discouraged from attempts to loosen screws.

"Our engineering department specified Phillips Recessed Head Screws on both trucks and busses," explained the technical assistant to Mack's general superintendent. "Since we are turning out 1750 trucks and 200 busses a month, and each unit requires thousands of Phillips Screws, there are good reasons for this specification.

"STOP DRIVER SKIDS THAT STOPPED THE ASSEMBLY LINE. Phillips Screws ended the scratching and puncturing of aluminum panels by drivers skidding out of slotted screw heads. We save the time and labor of interrupting our progressive assembly to remove and replace panels. That was the big cost — many times the cost of the damaged panels themselves — and that's just one way Phillips Screws save us money.

"BETTER DRIVER CONTROL. The positive fit of the driver in the Phillips Recess makes it practicable for us to use air power tools and speed driving. Even when driving at an angle, we avoid slips. And, with a spiral driver, the operator is able to tighten a screw by 'feel' without danger of chewing up the head.

"CONTRIBUTES TO DESIGN OF BUS INTERIORS. Particularly when large screws are used, the Phillips Recessed Head adds ornamental design to the interior, while slotted heads, with the slots pointing every which way, detract from the trim appearance we aim for. Furthermore, it discourages passengers from attempting to loosen Phillips Screws as they often do slotted screws, with snagged clothing a result."

FOR IDEAS USEFUL IN YOUR ASSEMBLY, get this study of Mack Mfg. Corp. methods, and other assembly reports covering metal, wood, and plastic products. Mail this coupon NOW!

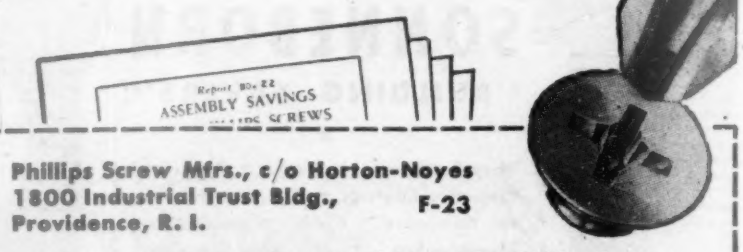
PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
International Screw Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.

24 SOURCES

National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wolverine Bolt Company



Phillips Screw Mfrs., c/o Horton-Noyes
1800 Industrial Trust Bldg., F-23
Providence, R. I.

Send me reports on Assembly Savings with Phillips Screws.

Name.....

Company.....

Address.....

No, he's not washing the floor . . .
he's *hardening* it with

LAPIDOLITH

to save it from concrete dusting and disintegration

LAPIDOLITH *Liquid* (patented) thoroughly hardens concrete floors for heavy-duty service without interrupting work schedules . . . saves the cost and inconvenience of patching and retopping.

10 TIMES HARDER

LAPIDOLITH penetrates quickly and deeply, reacting with the lime in the cement to form a close-grained, granite-like surface 10 times harder than untreated concrete. Dusting is eliminated; danger from alternate freezing and thawing minimized; floor protected against action of oils and many chemicals. Excellent for terrazzo floors, too.

EASY TO APPLY

Lapidolizing is just as *easy* as washing a floor. The first treatment is the only treatment—the first cost is the only cost. In fact, the results gained with LAPIDOLITH cost less than any other known method of dustproofing and wearproofing floors!

More facts in SWEET'S, or write Dept. F11 for illustrated brochure packed with floor-saving information.

You can do this to many untreated concrete floors, but not to a Lapidolized floor!

SONNEBORN
"BUILDING SAVERS"

Floor Treatments • Waxes • Paints and Protective Coatings • Concrete and Mortar Admixtures • Waterproofing and Dampproofing • Caulking Compounds Roof Coatings

IF IT'S WORTH BUILDING IT'S WORTH SAVING

Building Products Division, **L. SONNEBORN SONS, INC.,** New York 16, N. Y.

In the Southwest: Sonneborn Bros., Dallas 1, Texas

other like "fringe" items, ability to pay must be considered a controlling factor. (In re arbitration between St. Louis Public Service Company and Amalgamated Association of Street Electric Railway and Motor Coach Employees of America)

***CLASSIFICATION RETROACTIVE**

An employee's classification of steam fitter should be made retroactive to the date when he was first assigned to work with steam fitters where the evidence shows that the employee performed duties of a steam fitter's job from such date on. The company contended that the employee did not have prior experience which would qualify him as a steam fitter. However, whether or not the employee had prior experience is not determinative of the issue. The important question is what work did the employee actually perform. The fact that the company permitted him to perform this work is decisive of the issue even though it may have assumed that the employee was not qualified to do the work.
(In re arbitration between Benjamin Electric Manufacturing Company and United Electrical, Radio, and Machine Workers of America)

***UNION GUILTY OF CREATING ILLEGAL MONOPOLY**

Fishermen's union which controlled virtually all manpower engaged on boats in catching and marketing fresh fish in the state is guilty of creating an illegal monopoly where it sought by means of union rules to limit production and to establish and maintain minimum prices of fresh fish marketed by it within the state. The union, by the strength of its members, dominates the business of catching and marketing fish in the area. It controls certain rooms where fish may be sold, limits the quantities of certain kinds of fresh fish which union-manned boats may bring into the state ports, fixes minimum prices under which they will not consent to have fish caught by them sold to the public.

This dispute is between the union and the buyer. It is not a labor dispute and does not arise out of any provision of any of the contracts between the union and vessel owners or dealers. It is not a controversy concerning terms and conditions of employment between union employees and their employers. Those terms and conditions are established by collective bargaining agreements in full force and effect between vessel owners and dealers and the union. This is an encounter between the union and the law of supply and demand.

The purpose behind the union's action in limiting catches and fixing minimum prices was to force buyers to pay for certain kinds of fish. The union, by its unilateral action of establishing minimum prices for an essential article of food, has created a monopoly whereby competition in the area in the price of such goods is restrained or prevented. Entering into an agreement or combina-

How Reliance V★S can help *you* meet the greatest challenge industry has ever faced

WAGES go up and up, along with materials and other manufacturing costs. But to keep America prosperous, prices cannot be permitted to spiral to the point where large numbers of consumers are forced out of the market. How to prevent this presents the greatest challenge industry has ever faced.

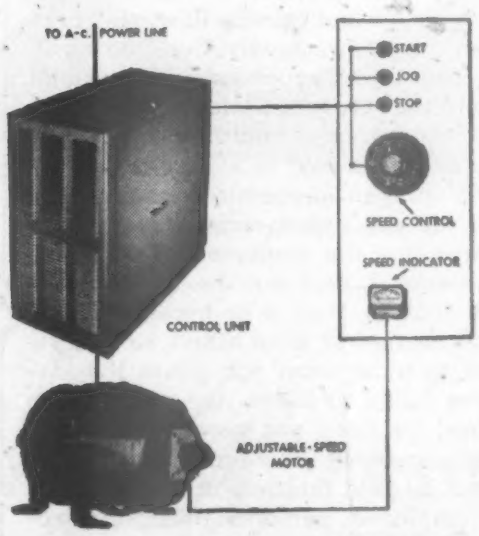
One sound answer is increased production through the use of more efficient machinery and methods. And this is where Reliance V★S can help you. *We have yet to find the industry where the V★S Drive cannot improve the quantity and quality of output, while lowering costs.*

A Reliance Application Engineer will survey your operations, then show you where and how you can benefit most through use of V★S—*the All-electric, Adjustable-speed Drive, operating from A-c. Circuits.* Just phone the nearest Reliance representative or write us direct for Bulletin 311.

RELIANCE ELECTRIC & ENGINEERING CO.
1070 IVANHOE ROAD • CLEVELAND 10, OHIO
Sales Representatives in Principal Cities

RELIANCE V★S DRIVE

Available in the Electronic System (1 to 5 hp.), in the Rotating System (1 to 200 hp.), or in a combination of both systems.



Reliance V★S Drive provides unlimited flexibility of machine operation. Starting, stopping, speed changing, reversing, maintenance of proper tension and other functions are exercised automatically or manually from nearby or remote stations.

RELIANCE A-C D-C MOTORS

"MOTOR-DRIVE IS MORE THAN POWER"

WANTED:
Problems!
Many uses of "dag" colloidal graphite came from Acheson laboratories as answers to problems brought to us . . . problems as diverse as the lubrication of oven conveyor-chains and the coating of vacuum tubes. "dag" colloidal graphite, in appropriate carriers, proved to be the unique and perfect solution to both problems.
For problems involving high or low temperature lubrication, cutting oils, dry-film lubrication, electrical conductivity, and opacity, "dag" colloidal graphite is now the accepted answer.
How many other problems it will solve we cannot say. We have the laboratories and the engineers. YOU bring the problems!
dag colloidal graphite

Please send us information on the uses of "dag" colloidal graphite:

- 16 page data and reference book ☐
- Parting Compounds ☐
- Dry-Film Lubrication ☐
- Impregnation of fabrics, porous metals, leathers, etc. ☐
- Press Fitting ☐
- Lubricants for forging, drawing and extruding ☐
- Oil Additives for boundary conditions ☐
- Running-in New Equipment ☐
- Elimination of Static-Sparking ☐
- Cutting Fluids ☐

ACHESON COLLOIDS CORPORATION

Port Huron, Michigan, Dept. L-6
Please send me without obligation, a copy of each of the bulletins checked:

NAME.....

POSITION.....

FIRM.....

ADDRESS.....

ZONE NO.....STATE.....

dag REG. U.S. PAT. OFF. COLLOIDS

(Lubricants containing "dag" colloidal graphite are available from major oil companies.)

LABOR DEVELOPMENTS *(continued)*

tion whereby the price of a commodity may be duly enhanced is in violation of the common law, and is contrary to public policy and is illegal. (Massachusetts v. McHugh; Mass. Superior Court)

***LEAVE OF ABSENCE ALLOWED TO STATE LEGISLATIVE REPRESENTATIVE**

Under a contract clause which provides that "employees elected or appointed to represent the union at national, state, or county conventions or conferences of the union shall be permitted to be absent for the time reasonably necessary to attend such meetings," the word "conference" cannot be taken to mean, necessarily, a conference consisting entirely of union members. A "conference of the union," the arbitrator ruled, may well be a conference between union representatives and a governmental officer of the Department of Labor, or "conference" between union men and members of the legislature or a committee thereof. Therefore, the employer was guilty of violating the contract when he refused to grant "part-time" leaves of absence to an employee who was appointed state legislative representative. At most, the leave would have required one or two days per week over the comparatively short period of the legislative session.
(In re arbitration between LeRai Manufacturing Company and International Union, United Automobile, Aircraft, and Agricultural Implement Workers of America)

***AN EMPLOYEE WHO REFUSED UNPLEASANT JOB NOT DEEMED TO HAVE QUIT**

An employee who left the plant rather than accept an assignment to an unpleasant job which had previously made him ill shall not be deemed to have quit. The assignment of work in the absence of specific provisions in the agreement is a prerogative of management. However, this right must be exercised fairly and not used in a manner whereby an employee is discriminated against. Management was informed in this case that the employee had become ill when working on the job previously. Considering all the facts and circumstances, it cannot be said that the employee quit the service of the company voluntarily. The case must be considered as a discharge.

The proper procedure would have been for the union committee to have insisted that the employee go on to the job assigned, and for the employee to have done so, then if he became ill as a result thereof to have asked for assignment to some other job. Since the employee failed to follow the proper procedure, he need not receive back pay when reinstated. However, the company cannot be held faultless in insisting that the employee perform this work regardless of whether it made him ill or not. The company's attitude in this regard tends to indicate an effort to force the employee to quit, and is considered as discriminatory.
(In re arbitration between Packers By-Products Company and United Gas, Coke, and Chemical Workers of America)

COOPERATION
KEY TO PRODUCTION
Present tangible recognition to employees through Robbins real karat gold awards. Nothing replaces gold in value; nothing replaces employee recognition for increased production, improved labor-management relations, and greater worker interest. Sketches and designs submitted without obligation.

THE ROBBINS CO.
ATTLEBORO, MASSACHUSETTS

All NATIONAL pallets are guaranteed for flawless construction. Each pallet made of moisture controlled hardwood at the source of lumber supply—and expertly assembled with hardened-steel drive screws. NATIONAL pallets will last longer under industry's toughest demands.

Industry's largest users specify *rugged* pallets from NATIONAL—the country's largest pallet manufacturer. NATIONAL supplies the engineering and design know-how for any and all types of materials handling programs.

Write or wire for descriptive literature

NATIONAL PALLET CORPORATION
MAIN OFFICES: OLIVER BLDG., PITTSBURGH 22, PA.

SAFER TO WORK WITH...

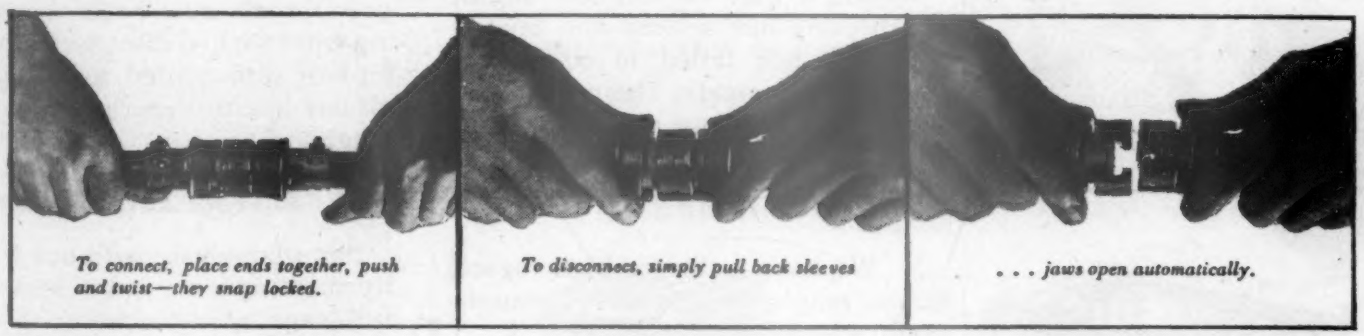
Thor **AIR HOSE COUPLINGS**

Thor Air Hose Couplings form positively locked connections that cannot break, jar or whip apart. Tool operators prefer their simplicity . . . and the speed and ease with which they can be connected and disconnected. All sizes and combinations are interchangeable up to ¾ inches, inclusive. Each hose end is identical with the other—no right or left . . . no male or female—*a real universal coupling that fits every job.* Made of heavy, rust-resisting steel for lasting service. Call your Thor distributor for a demonstration.

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. Jackson Boulevard, Chicago 6, Illinois

Birmingham Boston Buffalo Cincinnati Cleveland Denver Detroit Houston Los Angeles Milwaukee
New York Philadelphia Pittsburgh St. Louis St. Paul Salt Lake City San Francisco Toronto, Canada London, England



To connect, place ends together, push and twist—they snap locked.

To disconnect, simply pull back sleeves

. . . jaws open automatically.

. . . Thor **PORTABLE POWER TOOLS**

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

Send for FREE Industrial Crayon Guide
Dept. F-22

the AMERICAN CRAYON company
Sandusky, Ohio
NEW YORK • SAN FRANCISCO • DALLAS

THEY SAY AND DO

AMERICAN SYSTEM RE-SOLD TO WORKERS AND PUBLIC

CLARK KING, Vice President, Allegheny Ludlum Steel Corporation, from an address before the American Management Association

Our American system of business and enterprise—the system under which this nation grew and became great—is challenged from every side. Unless management is able, through reasserted leadership, to regain public and worker understanding and faith, the prospects are dark.

Management, with a few exceptions, hasn't supplied Joe Doakes with leadership since the old days when the boss owned the works and ran them. He knew his employees and they knew him. He knew their affairs and they knew his business. Now, however, Joe doesn't rub elbows with the boss. But he's still interested in what's going on. Surveys show that Joe does listen and wants to learn all he can about his means of livelihood. That's true whether he is an employee, a butcher, or a doctor.

How are we going to reach Joe? How are we going to make him believe our story?

First, we [at Allegheny Ludlum] attempted to find out what the people with whom we come in contact thought about us and our industry.

We were amazed at the findings—the misinformation—the misunderstanding—lack of information—discredit.

We knew that we had been lax in interpreting our actions and operations. We had failed to counteract adverse propaganda. The opinions of our neighbors were our own fault. What should we do about it?

We decided upon this four-point program:

1. We have a sincere high regard for our employees and the communities in which they live.

2. We pay good wages.

3. We earn fair profits.

4. We want to prevent "Boom and Bust."

That was the theme. And we had the facts and figures to prove every point.

We laid out a 2-week campaign that would take us into our principal plant communities and cover most of our employees. (See "Selling the Company to the Community," FACTORY, April, 1947, page 78.)

During the first week, the plant managers called their supervisory employees together and gave them all the details of the plan.

This laid the groundwork for the entire program. The supervisors, and by that I mean the entire managerial group from foremen up, were given a thorough understanding of what we were trying to accomplish and the means we were taking to meet the desired end.

Each was asked to explain our program to the men under him. Their understanding and cooperation spelled the difference between complete and partial success of the plan.

The second week, during which we decided to go directly to the people of our plant communities, called for a more elaborate program. This consisted of meetings, publicity, advertising, booklets, and posters.

Obviously, we could not meet and talk personally to everybody in a community. So what we did was invite a cross-section. We particularly tried to invite the opinion-creating people. Among those to whom we sent letters of invitation were business leaders, professional leaders, local union officials, officers of civic and social clubs, ministers, priests, rabbis, and educators.

In each town we talked to some 200 to 350 people. The entire executive staff of the company was present, and at the conclusion of our talk we opened our meetings to questions from the floor.

As our friends left the meeting, we gave them a little booklet summarizing what we had discussed. The booklet was also mailed to the homes of all our workers and to many of their neighbors.

Full-Page Advertisements

Simultaneously with our community meetings, we ran a series of five full-page advertisements in all local papers, explaining our plan.

But we knew that the job had only begun. Ours could not be a one-shot program. We had the confidence of a majority of our neighbors, and, incidentally, our employees. We could not afford to let them down by discontinuing to release the facts in an understandable manner.

There has seldom been a day since our program began that one or more of our communities has not been given facts and figures about our operations, plans, or activities.

I will give you a few of the hun-

REEVES Sales & Service Representatives—from Coast to Coast!

California
Western Gear Works, Lynwood
Pacific Gear & Tool Works, San Francisco 3

Colorado
R. F. Hamilton & Associates, Denver 2

Florida
H. C. Flanagan, Tampa 1

Georgia
Reeves Pulley Co., Atlanta

Illinois
Reeves Pulley Co., Chicago 6

Indiana
A. R. Young, Indianapolis 4

Kentucky
Alfred Halliday, Louisville 2

Louisiana
F. N. Johnston, Inc., New Orleans 12

Maryland
Carey Mchy. & Supply Co., Baltimore 2

Massachusetts
Reeves Pulley Co., Cambridge 42

Michigan
Reeves Pulley Co., Detroit 11

Minnesota
R. X. Raymond Co., Minneapolis 3

Missouri
W. C. Carolan Co., Kansas City 6
Bates Sales Co., St. Louis 1

New York
Reeves Pulley Co. of N. Y., Inc., New York 7
Potter & Dugan, Inc., Buffalo 2
Potter & Dugan, Inc., Rochester 4
Potter & Dugan, Inc., Syracuse 2

North Carolina
M. R. Snyder Co., Charlotte 2

Ohio
Reeves Pulley Co., Cleveland 3
John T. Young, Cincinnati 23

Oklahoma
Ward R. McGavren Co., Oklahoma City

Oregon
C. W. Harshberger, Portland 4

Pennsylvania
Reeves Pulley Co., Philadelphia 4
W. G. Kerr Co., Pittsburgh 22

Rhode Island
Machine Parts Corp., Providence

South Carolina
J. W. Vaughan Co., Greenville

Tennessee
Riechman-Crosby Co., Memphis 1

Texas
Geo. J. Fix Co., Dallas 1
Brance-Krachy Co., Inc., Houston 1

Utah
James Q. Leavitt Co., Ogden

Virginia
Asa A. Tuttle, Norfolk 1
Smith-Courtney Co., Richmond 11

Washington
Western Gear Works, Seattle 4

West Virginia
E. W. Smith, St. Albans

Wisconsin
Parsons-Caro Co., Milwaukee 2

CANADA

Ontario
Peerless Engineering Sales, Ltd., Toronto 4

REEVES is also represented by speed control specialists in 18 foreign countries.

It Pays to Know Your REEVES Speed Control Engineer

In more than 260,000 widely diversified industrial installations covering some 25,000 plants—and as standard equipment on more than 2,100 different makes of machines—REEVES Speed Control is providing the infinite, accurate speed adjustability which assures increased output, improved, uniform quality and lower manufacturing costs.

Sharing the credit for this enviable record—along with the men who design and build REEVES Variable Speed Drives—is a third group of men. These are the men whose reponsibility it is to see that every REEVES application is correctly engineered, installed and serviced—REEVES Speed Control Engineers.

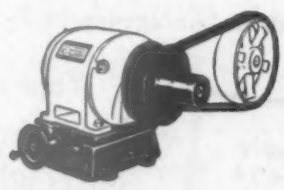
Realizing that its obligation to users of REEVES-equipped machines does not end with the closing of the sale, but continues throughout the operating lifetime of the equipment, REEVES today maintains a nation-wide organization of these *specialists in the specialized field of speed control engineering.* Check the list at the left for the name of the REEVES representative nearest you. Feel free to consult him, without obligation, on any speed control problem relating to the machines you build or operate. He's a valuable man to know because he knows his business.

REEVES PULLEY COMPANY • Columbus, Indiana

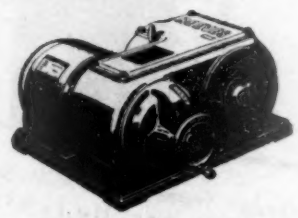
Recognized Leader in the Specialized Field of Speed Control Engineering

THE THREE BASIC REEVES SPEED CONTROL UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.



VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 15 hp.



MOTOBRIVE combines motor, speed varying mechanism and reduction gears in single compact unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 15 hp.

Accurate Variable
REEVES Speed Control
Gives the Right Speed for Every Job!

THE WAVY SET BLADE by MILFORD is back again!

Here is a band saw blade of unique design which, on horizontal band saw machines such as Wells, Johnson and Kalamazoo, and on all vertical cut-off machines, will . . .

- • • **increase blade life an average of 30%***
- • • **positively eliminate ripping of teeth**
- • • **cut with greater precision and closer tolerances**

* from actual reports of current users

Originated by MILFORD and discontinued in the interests of standardization during the war. The efficiency of this blade, however, has been so thoroughly demonstrated on the horizontal type of machines now extensively in use, that the 3/4" 10 and 12-tooth wavy set sizes have been added to the standard list and are available for immediate shipment.

Your own machines are your best proving ground. Test a MILFORD **WAVY SET** BLADE against the field!

Order from your Mill Supply Distributor. He is always ready to serve your needs for all factory and mill supplies as well as MILFORD hack saw and band saw blades.

MILFORD PROFILE AND BAND SAW BLADES RESISTOR AND DUPLEX HACK SAW BLADES

THE HENRY G. THOMPSON & SON CO.

Saw Specialists Exclusively for Over 65 Years

NEW HAVEN 5, CONNECTICUT, U. S. A.

dreds of reasons why we know our program is paying off.

Let us take the employee report I just mentioned which we made to our employees and neighbors.

We had the results of that report checked on a house-to-house canvass by independent investigators. They were amazed to find that 85 per cent of those who received the report not only read it, but remembered its details a month after it was delivered to them, particularly when the previous high for readership and retention for similar reports had been 65 per cent.

Aside from independent surveys, we have literally hundreds of personal expressions from our employees, shareholders, newspapers, and neighbors that make us sure that our program is paying off.

We are serious about our attempt to re-sell America's industrial system to the public—the real down-to-earth public. We believe that if all companies will join us in our campaign, our system—which we know is the best yet devised—will be preserved.

A UNION OFFICIAL LOOKS AT PLANT NEWSPAPERS

LAWRENCE RAGIN, Educational Director, Textile Workers Union of America, in a speech before the American Management Association

In those plants where a union exists, the task of developing a spirit of loyalty and increasing productivity by means of the plant newspaper has been complicated by the fact that the editors cannot now write about the problems which most concern the workers without mentioning the union. Workers are interested in wages, hours, and working conditions. They are interested in the settlement of grievances.

They are interested in pay raises, in the adoption of company paid-for insurance and pension programs. They are interested in what happens to a job evaluation; in who will be laid off in case of a cut-back in production or the introduction of a technological improvement.

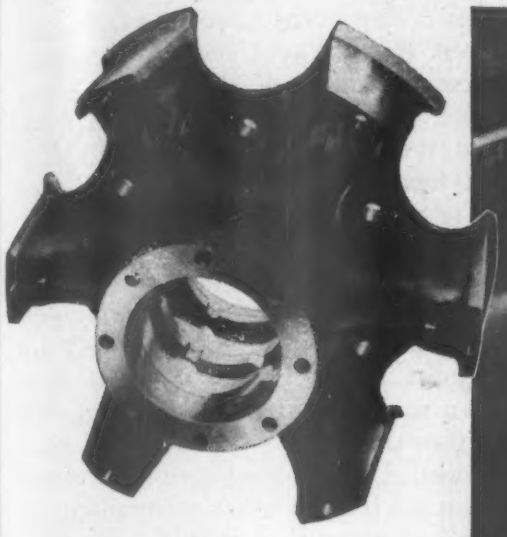
But, despite the fact that, for the worker, the most important news in the plant involves the union, in most instances the editor doesn't know quite how to handle the union in his paper—or has been instructed not to handle it at all.

As a result, when we look through the papers and magazines published by the corporations of this country for their employees, we find that they omit mention of any of those concerns which the workers consider so vital. They are filled with stories of wed-

5,000 Holes per day

with CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF.



Three multiple spindle set-ups, one of which is illustrated at the right, are employed to drill the 20 holes in this cast steel truck wheel. An average of 250 wheels are drilled each day—a total of 5,000 holes. CLE-FORGE High Speed Drills are given much of the credit for maintaining this production rate.

This job is typical of many where CLE-FORGE High Speed Drills have demonstrated their superior performance. Because these drills produce *more holes per grind,* they are an important factor in reducing "down time" and increasing output. If you have not already used CLE-FORGE High Speed Drills and experienced their many advantages, we urge you to . . .

Telephone your I INDUSTRIAL S SUPPLY D DISTRIBUTOR

Always Room UPSTAIRS

Plenty of it . . . when you use the Crescent *Electric* Palletier. It multiplies storage capacity in warehouses that seem to be bursting at the seams. The Palletier transforms vertical space into useable space. Your loads are neatly stacked, tier on tier, high above the floor. Removed easily from storage, too.

The Palletier slashes your handling costs as it slices your handling time. One man lifts, transports, tiers and detiers. Compact, extremely maneuverable, the Crescent Palletier slips in and out of congested quarters with ease. It has plenty of power to climb ramps . . . speed loading and unloading of common carriers . . . is available in 1, 2, 3, 4, and 6,000-pound capacities. Free bulletins sent on request.

ONLY *Crescent* HAS ALL 5

- **Full Magnetic Contactor Control** protects against forced acceleration — extends life of motor and tires.
- **Complete stability** with load fully elevated and tilted forward.
- **Battery power** eliminates fumes and fire hazard.
- **Full accessibility** to all mechanisms for easy inspection and maintenance.
- **Maximum Visibility** — operator spots and tiers without stirring from seat.

CRESCENT TRUCK COMPANY
1100 Willow St., Lebanon, Pa.
Industrial Truck and Tractor Specialists Since 1917

Crescent
ELECTRIC
PALLETIER
REG. U. S. PAT. OFF.

dings and births, pictures of fish caught on vacation, stories about new plants being opened or new products being developed, about hobby shows, about shifts in supervisory personnel, about all those things that are encompassed in the phrase "human interest" as applied to journalism.

When I try to understand why so many plant publications omit mention of the great problems that confront the workers because it would mean mention of the union, I can come to only one conclusion. I think that it is because *top management itself has not made up its mind whether it is going to live with the union, whether collective bargaining has a permanent place in the relations between the company and its employees.*

So the editors of plant papers are caught in an *impasse* not of their own making. Until top management makes up its mind about its relations with the union, the paper cannot deal with the hottest news in the plant, the kind of news that would win workers' confidence for whatever else he carries in his paper.

Yet these same publications that ignore the basic problems of the employees because the union is involved, may carry long and involved articles on economics, or on the company's financial standing, or on sales problems, or on the need for increased worker productivity.

I wonder how the editors of the papers or the owners of the plants can expect their employees to have confidence in anything a paper says when the paper ignores the basic problems in which the worker is concerned. We know that our members do read plant publications. The more gossip they have in them, the more avidly they read them. We also know about all they read is gossip.

It is my judgment that, until plant managements make up their minds about the fundamental relationship between themselves and the union, a large part of the funds now being spent for plant publications will be wasted. For the papers reflect the inability of most plant managements to recognize that company loyalty and union loyalty are not mutually exclusive, once the company and the union decide to live together.

NEW LABOR LAW BACKED BY PUBLIC OPINION

JOSEPH M. GAMBATESE, Washington Labor Editor, McGraw-Hill Publishing Company, before Ohio Chamber of Commerce

One fact stood out after last year's elections. It was that the people of

the country—not only the employers, not only the Republicans, but the voters at the ballot box — wanted something done about the labor problem, the strikes. Perhaps I should say, to borrow the Republican slogan, they "had enough."

The people didn't say what should be done, but it was unmistakably clear that they wanted action of some kind. This was evident wherever you went around Washington. Even congressmen and senators friendly to labor recognized it, and admitted it. New labor legislation was in the air. It was inevitable.

What to Put Into the New Law

The only question was *what*—and *how much*—to put into a new law. Here is where the leaders of labor made their big mistake. They had read the signposts along the road. They knew where we were heading. They might have kept the turn in the road from being so sharp — if only they had suggested just a minimum of regulation to eliminate at least some of the abuses which the labor leaders themselves admitted were unjustifiable. But they did not. They preferred to hang on tight, hoping that nothing would happen. They gambled, and they lost.

Opinion Polls Pointed the Way

How do we know—or how did Congress know—that the people wanted something done about the labor situation?

There were at least two indicators. One was the public sentiment expressed through the many polls of public and worker opinion. Another was the startling swing to the Republican column by the voters last November.

Practically every poll of opinion—by Gallup, by newspapers, by the magazines—showed not only that the public wanted a stop put to labor strife and labor abuses, but also that the working man wanted it.

Furthermore, these polls indicated a desire for many of the things which the Taft-Hartley Act provides.

Look at these examples:

Union members — 70 per cent against the closed shop and union shop. This incidentally, was a composite answer from polls conducted over a period of 10 years by one of the McGraw-Hill magazines—"FACTORY."

The public — 66 per cent for the open shop. For the union shop—only

V the Washable OIL PAINT

VALDURA SINGLEKOTE PRIMES SEALS and FINISHES in COAT

Cover all surfaces with SINGLEKOTE

- ECONOMY — Initially inexpensive, SINGLEKOTE combines extra hiding power and economy with washablity, durablity and performance.
- LABOR SAVINGS—Providing one coat coverage, with sealing, priming and finish coats simultaneously applied, one man does the work of two when SINGLEKOTE is used on the job.
- ILLUMINATION—Actual, on-the-job tests have demonstrated that SINGLEKOTE'S excellent reflectivity without glare can increase illumination as much as 65% — effecting a substantial savings in illumination costs.
- PRODUCTION EFFICIENCY—In a test factory, where errors and material waste were directly attributable to employee fatigue, improved illumination around working areas stepped up production efficiency as much as 10%.
- EASE OF APPLICATION—SINGLEKOTE may be applied by brush or spray — forming a perfect bond through its controlled penetration and strong, adhering qualities. Tint to any desired shade.
- LOWER MAINTENANCE COSTS—Exhibiting excellent fume-resisting and non-yellowing features, SINGLEKOTE removes the necessity for frequent repainting by withstanding innumerable washings without loss of finish.

Use SINGLEKOTE for perfect one coat coverage on plaster, concrete, brick, wood, or metal surfaces.

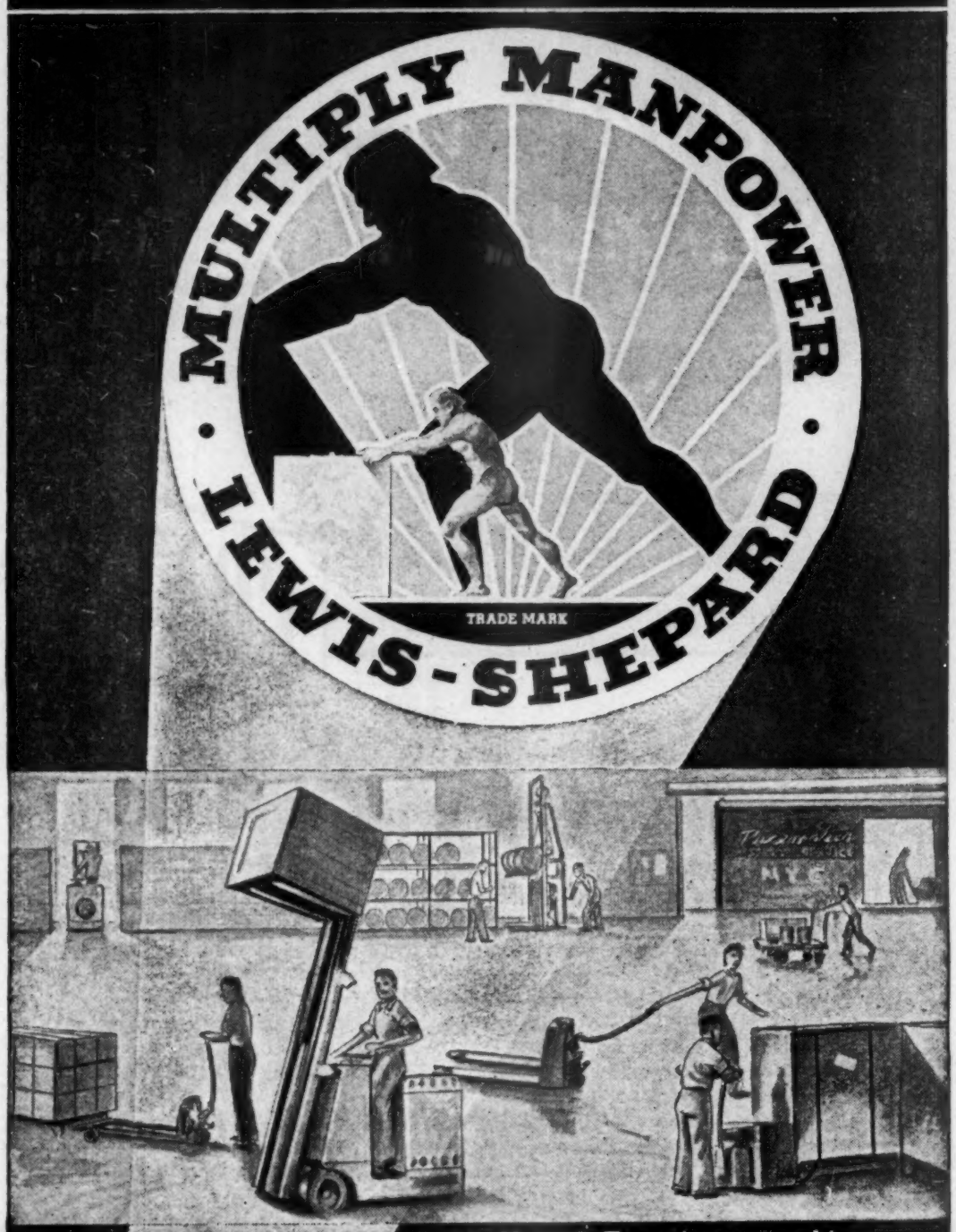
CALL YOUR VALDURA DEALER

America's No. 1 Heavy Duty Paint Manufacturer!

VALDURA PAINTS THAT ENDURE

AMERICAN-MARIETTA COMPANY • Valdura Division
43 East Ohio St. Chicago 11, Ill.

Sign of a Great Line



32 Years' Experience making MATERIALS HANDLING EQUIPMENT for thousands of satisfied customers all over the world. You, too, can SAVE MONEY; you, too, can cut costs; increase storage space; reduce accidents, multiply manpower; and speed up production with L-S POWER FORK TRUCKS . POWER JACKLIFTS . MECHANICAL JACKLIFTS . SINGLELIFTS . HYDRAULIC HANDLIFT TRUCKS . SKIDS . FLOOR TRUCKS . STACKERS . CRANES . PALLET STACKERS . PALLET TRUCKS.

Write for New Catalog of a Great Line

LEWIS-SHEPARD PRODUCTS INC.

314 WALNUT STREET WATERTOWN 72, MASS.

REPRESENTATIVES IN PRINCIPAL CITIES CONSULT YOUR PHONE DIRECTORY

18 per cent. For the closed shop—only 8 per cent. That's Gallup.

Opinion of country newspaper editors on the closed shop — against it — 72 per cent.

Opinion of union members on spending union funds for political purposes—against it 64 per cent. Public opinion—71 per cent against it.

Every poll showed the public was:

For new labor legislation.

For changing the Wagner Act, but not killing it.

For union financial reports.

For cooling-off periods before strikes.

For making unions live up to their contracts.

These same polls also showed that the public was against some union practices. The public was:

Against secondary boycotts.

Against jurisdictional strikes.

Against featherbedding and other types of abuses.

Here was an unusual poll by the *Washington Post*. The people of Washington, D. C., who incidentally have no right to elect their own public officials, sometimes get a chance to vote in a newspaper poll. In this case, a large majority voted that the public, rather than either labor or management, was in the greatest need of protective labor legislation.

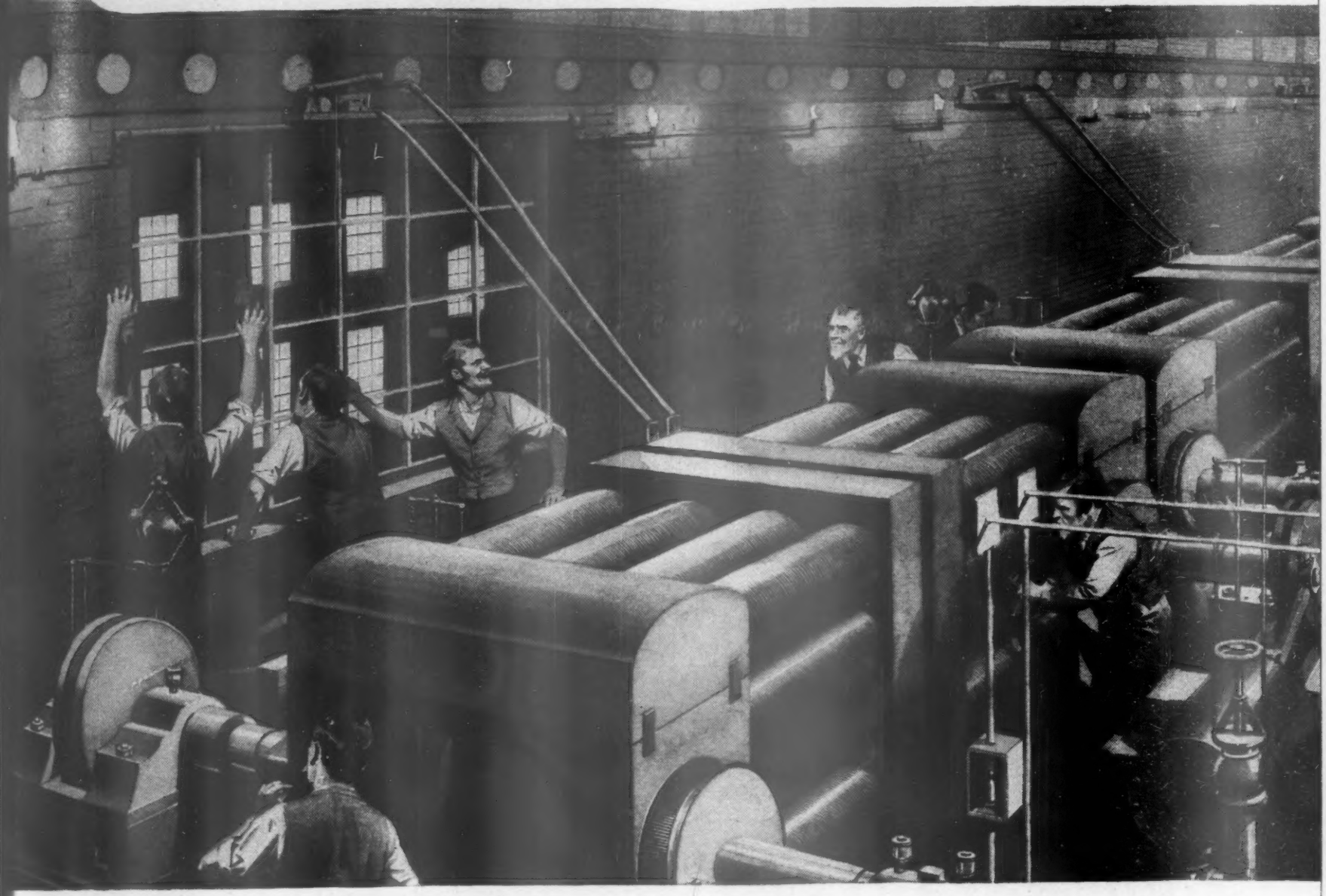
Election Shows Trend

If you don't accept public opinion polls, then look at what happened in the last election. Congress, in the spring, had passed the Case Bill intended to curb the power of union leaders. CIO's Political Action Committee — the PAC — as well as the American Federation of Labor, tried to defeat every Congressman who voted for the Case Bill. You know what happened. Instead of losing ground, the forces friendly to enacting labor curbs gained strength.

The Democratic organization, which fought the Case Bill, not only lost control of the House, as predicted, but also lost the Senate. In the Senate, the Republicans converted a 17-vote deficit into a 6-vote majority. In the House, where they had been 47 votes shy, the Republicans wound up with a 55-vote edge over the Democrats.

Still labor leaders would not believe that the vote was a protest against labor abuse of its power. They attributed the Republican revolution to a public protest against war-

CONFIDENCE... how much is it worth?



IN 1880, when electric lights first were tried on New York's Broadway, Roebling's confidence in the future of electricity motivated a new Roebling undertaking . . . the manufacture of electrical wire and cable.

Roebling's contribution to this great industry during the past sixty-seven years is a matter of record. Its leadership was attained and is being maintained by rigid high standards of quality . . . tireless development of superior products, better processes, and more efficient methods.

Your confidence in Roebling is valued by every Roebling employee. His income depends upon his ability to preserve that confidence. Every Roebling employee knows that you will continue to prefer the output of his hands only if he produces better products and gives you better service. Your confidence in Roebling is Roebling's best salesman.

This applies, not only to electrical wire and cable, but to all Roebling products.

HOW TO SOLVE WIRE AND CABLE PROBLEMS!

Electric wire and cable play an important part in every industry. Their efficient use depends upon their proper application. Hundreds of men in your industry have found a cooperative and helpful friend to lend a hand when they were puzzled with wire and cable problems. He is their Roebling Field Man.

They find that he really knows his electrical products and their applications, yet never hesitates to call the Roebling Engineers and the Roebling Development and Testing Laboratory.

We, here in Trenton, are constantly being reminded by grateful customers of the ability and integrity of their Roebling Field Man . . . of his honest and successful efforts to prove that the words "Confidence" and "Roebling" are one and the same.

At the right is a listing through which your nearest Roebling Field Man can be contacted. Why not call or write him today? Make an appointment to meet a friend who can save you both time and money.

JOHN A. ROEBLING'S SONS COMPANY

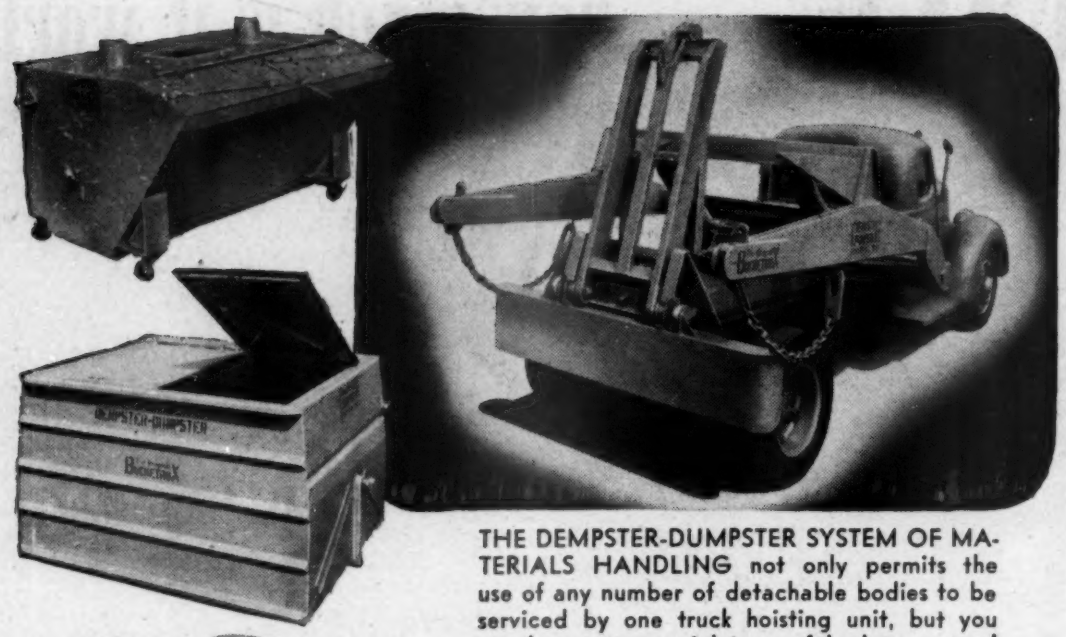
TRENTON 2, NEW JERSEY • *Branches and Warehouses in Principal Cities*

Atlanta	934 Avon Avenue . . . Raymond 2151
Boston	51 Sleeper Street . . . Lib. 4373
Chicago	5525 W. Roosevelt Rd. . . . Crawford 6400
Cleveland	701 St. Clair Ave., N.E. . . . L.D. 249 & Main 5030
Denver	1635 Seventeenth St. . . . East 2684 & Keystone 4111
Houston	6216 Navigation Blvd. . . . Woodcrest 6-8316
Los Angeles	216 S. Alameda St. . . . Trinity 1261
New York	19 Rector Street . . . Wh. 3-5200
Philadelphia	12 S. 12th Street . . . Market 7-2751
Pittsburgh	855 W. North Avenue . . . Fairfax 2766
Portland, Ore.	1032 N. W. 14th Avenue . . . Broadway 5456
San Francisco	1740 17th Street . . . Market 8787
Seattle	900 First Avenue, South . . . Main 4992

Manufacturers of Wire Rope and Strand • Fittings • Slings • Screen, Hardware and Industrial Wire Cloth • Aerial Wire Rope Systems • Hard, Annealed or Tempered High and Low Carbon Fine and Specialty Wire, Flat Wire, Cold Rolled Strip and Cold Rolled Spring Steel • Ski Lifts • Electrical Wire and Cable • Suspension Bridges and Cables • Aircord, Aircord Terminals and Air Controls • Lawn Mowers

ROEBLING

A CENTURY OF CONFIDENCE



THE DEMPSTER-DUMPSTER SYSTEM OF MATERIALS HANDLING not only permits the use of any number of detachable bodies to be serviced by one truck hoisting unit, but you can have any special type of body you need to meet your particular requirements to do the job quicker, easier and at far less cost. Many different types of bodies, four of which are pictured at left, are built for handling every conceivable type of materials from light, bulky to extremely heavy, as well as for liquid or dust. Capacities 1½ to 10 cu. yds. and up to 8 Tons pay load.

DEMPSTER DUMPSTER
TRADE MARK REG.

DEMPSTER BROTHERS, INC.
49 Springdale, Knoxville 17, Tenn.

RUST-OLEUM Stops Rust!

THIS FREE CATALOG TELLS YOU HOW . . .

$6,000,000,000 is the nation's *yearly* bill for rust damage to metal due to dampness, fumes, general weathering elements—an *irrecoverable loss.* You pay your share of this waste if your building, equipment and other property are rusting. Do something about it NOW! *Use Rust-Oleum to rustproof metal surfaces.*

You get lasting protection for less than 1-cent per square foot material cost, Rust-Oleum can be applied over metal already rusted — *wirebrushing away loose scale is only preparation required.* It penetrates rust . . . incorporates it in the film and forms a tough, durable, elastic coating that defies rust-producing conditions. *Available in all colors and aluminum.*

★
It Cuts Maintenance Costs
3 Ways

- **Less Preparation.** No sandblasting or chemical rust dissolvers are necessary. Simply wirebrush to remove scale, dirt, etc.—then APPLY RIGHT OVER THE REMAINING RUST.
- **Goes on Faster.** Rust-Oleum can be applied 25% faster...covers 40% more area per gallon.
- **Lasts Longer.** Depending on conditions, Rust-Oleum outlasts ordinary materials two to ten times.

GET THE FACTS—Mail This Coupon TODAY!

RUST-OLEUM CORPORATION
2437 Oakton Street • Evanston, Illinois

Please send a free copy of the new Rust-Oleum Catalog of color selections and recommended uses.

Name_____
Company_____
Address_____
Town_____ State_____

☐ Check here for name of nearest distributor.

time controls. This view is not supported by the Gallup polls.

In a poll taken during the election campaign, the public listed the need for strike control as the most important issue of the day.

Several months later, when the new Congress convened in Washington, the public was asked by Gallup to list the problems it felt to be the most important before the government at that time.

According to the answers received, the most important problem was not the control of atomic energy. It was not international relations. It was not housing. Nor was it high prices and inflation.

Most of the public said *strikes* were the biggest problem of the day facing the government.

How They Rated Them

Here is how the issues ranked according to the number of first-place votes: Labor legislation, 40 per cent; international relations and atomic energy, 26 per cent; inflation, 13 per cent; housing, 10 per cent. The public certainly wouldn't vote that way today.

Incidentally, the Wagner Act built labor unions up from a membership of less than 3 million in 1934 to approximately 15 million today. Five times as many members. Unions today are the strongest they have ever been. Yet the polls do not indicate any desire on the part of the public to destroy unions. While the public may want unions regulated, a majority believes that they are desirable, beneficial, and here to stay.

I do not think that the framers of the Taft-Hartley Act, or a responsible segment of management, want to destroy labor unions. But they want them to exercise responsibility commensurate with their power. They want to curb the power of union leaders, and put more of it in the hands of the worker whether he is union or non-union. They also want a balance between labor and management of rights and responsibilities.

JOINT PERSONNEL PLAN FOR AUSTRALIAN PLANTS

McGRAW-HILL WORLD NEWS, Melbourne

Ninety-seven per cent of Australia's factories cannot afford to employ full-time personnel supervisors.

To meet the challenge of larger firms in the race for factory labor, 26 clothing factories, with a total of 500

"Here's how to balance maintenance, sir, against your operating budget!"

MANAGEMENT HAS FOUND out that nowadays it takes a lot more juggling than formerly, to keep plant maintenance costs within bounds of profitable operation.

This is obviously true of big machine maintenance; and it is just as true of valve maintenance. For when you consider the thousands of valves in the average industrial plant—and consider today's high wages and costs of materials—you come to the simple conclusion that it just does *not* pay to install valves that need constant pampering. It *does* pay to install the most trouble-free, longest-lasting valves that money can buy—Jenkins Valves!

By specifying Jenkins Valves, you get the product of valve specialists, whose leadership in design, quality of materials, and workmanship has been recognized for over 80 years . . . yet you pay no more for this extra value.

Jenkins Bros. Engineers are always ready to help solve your valve problems, help reduce upkeep. *Sold through reliable Industrial Distributors everywhere.*

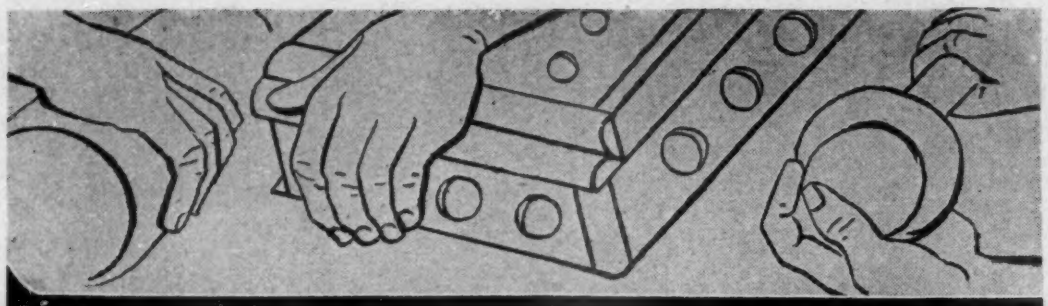
Jenkins Bros., 80 White Street, New York 13; Bridgeport; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal, Canada.

LOOK FOR THIS TRADE JENKINS MARK DIAMOND MARK

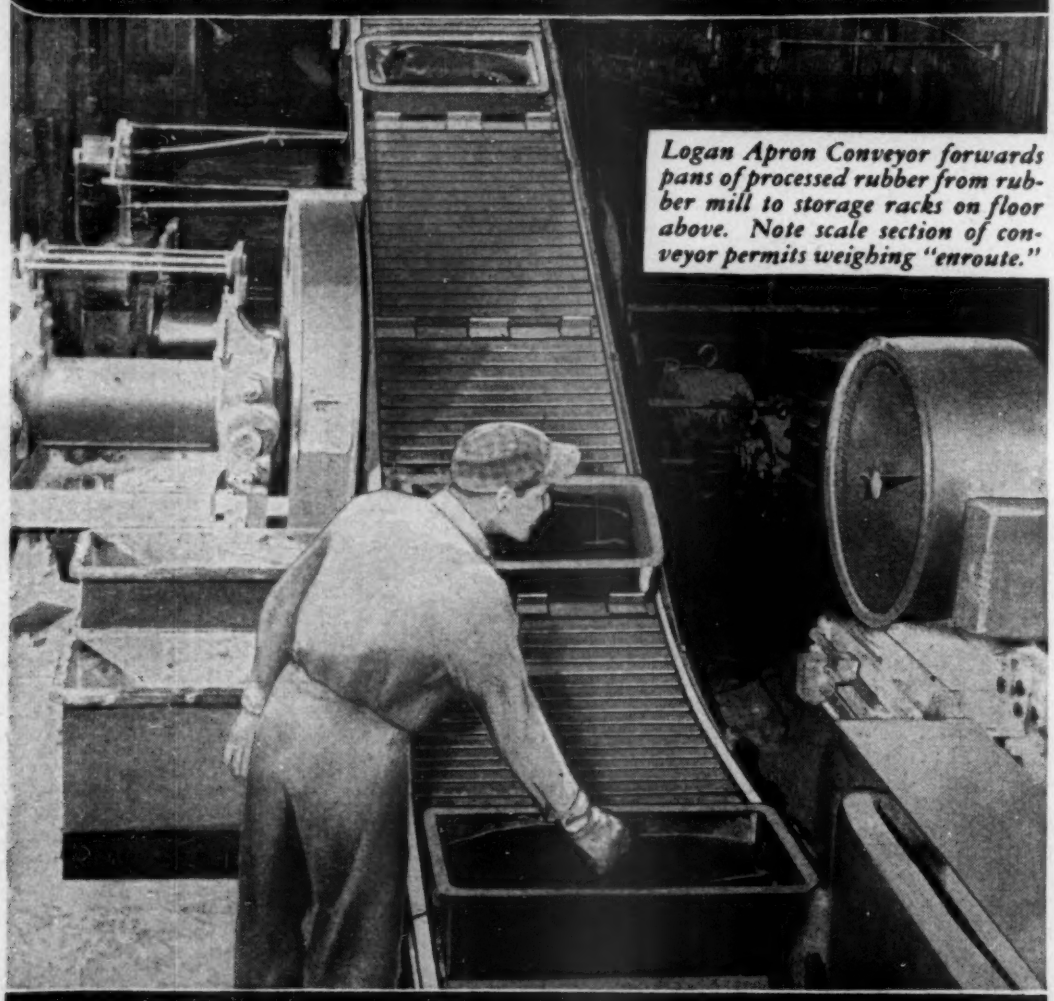
SINCE Jenkins Bros 1864

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



LEAST HANDLED..



Logan Apron Conveyor forwards pans of processed rubber from rubber mill to storage racks on floor above. Note scale section of conveyor permits weighing "enroute."

IS BEST HANDLED

Every time your product is handled manually it incurs added cost as it progresses through the successive stages of manufacture, assembly, packing, shipping. By reducing the number of times a product is "hand-handled" many manufacturers have shown either increased net profits or have undersold competition . . . in some instances have done both.

With all Logan Conveyor installations there follows a definite reduction in production costs. In fact, this company will not recommend an installation unless savings in operation are definitely indicated.

Look to Logan for the best in modern handling. The Logan name on your conveyors is assurance of maximum savings in time, effort, space . . . and in employee satisfaction and appreciation.

Logan Conveyors

LOGAN CO., INC., 510 CABEL ST., LOUISVILLE 6, KY.

workers, employ a personnel man who serves the entire group.

The cooperative plan, in operation three years, has served to keep labor turnover and absenteeism within bounds, and to attract hard-to-get female workers.

The personnel supervisor undertook to gain improved working conditions and form employees' social groups. Welfare policy for the group is determined by a representative committee of manufacturers. The plan costs 12 cents per week per worker.

SCHOLARSHIPS FOR FOUNDRY ENGINEERING STUDENTS

Six schools have received grants this year from 465 foundries. The firms have donated $250,000 to the Foundry Educational Foundation. Under the plan, schools will receive money from the Foundation for foundry equipment. Annual scholarship grants will be made to 140 foundry engineering students. Men will be trained for positions of foremanship and higher supervisory jobs.

Students will work at least one summer in a foundry approved by the foundation. They will also be helped to find jobs upon graduation.

PATTERN FOR BUILDING MANAGEMENT UNITY

C. F. HAWKER, Vice-president in Charge of Manufacture, Armstrong Cork Company, speaking before American Management Association

Recognize individual performance.

Determine what constitutes the standard of performance of management positions as objectively as possible.

Review each individual's performance with him periodically.

Promote on the basis of merit.

Accept supervisors as members of management.

Demonstrate such acceptance by daily actions.

Make certain that supervisors are not by-passed by other members of management or by the union.

Accord privileges such as parking, pay method, sick leave, etc., not given to rank-and-file workers.

Make sure supervisors have access to the boss.

Maintain three-way flow of information. Some companies have established a fairly effective flow of information from the top of the organization down to the man on the machine, but few of us have found

A BUYING GUIDE FOR ABRASIVES

POINT No. 10

REPUTATION

As many purchasing agents realize, known names carry plenty of weight in winning acceptance and approval of the men who use the products they buy. In abrasives, no name is more favorably known than that of The Carborundum Company. Instantly recognized and widely respected, it has signified peak quality for years.

Management knows well the standing of The Carborundum Company in industry. Men who have worked with these abrasive tools are familiar with their superior performance. When abrasives by CARBORUNDUM are specified and ordered, there is no need to defend, explain or justify your selection. They are the choice of those whose preference has been confirmed by experience. The Carborundum Company, Niagara Falls, N Y.

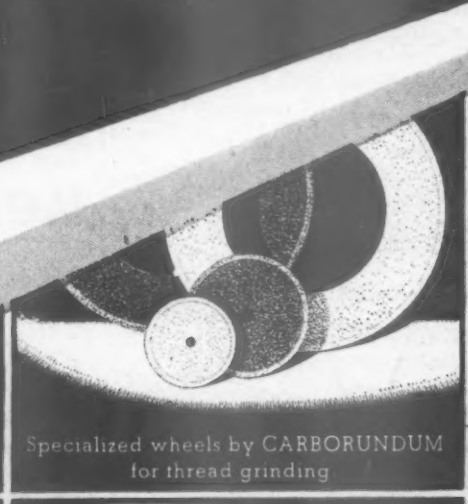
CARBORUNDUM

TRADE MARK

BONDED ABRASIVES

COATED ABRASIVES

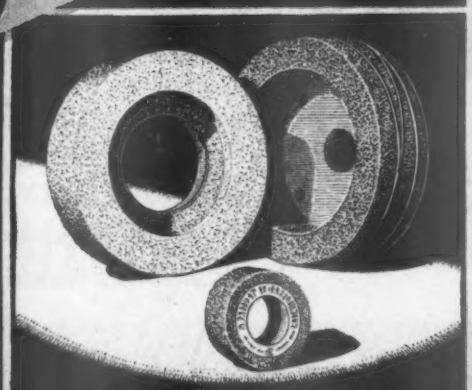
ABRASIVE GRAINS AND FINISHING COMPOUNDS



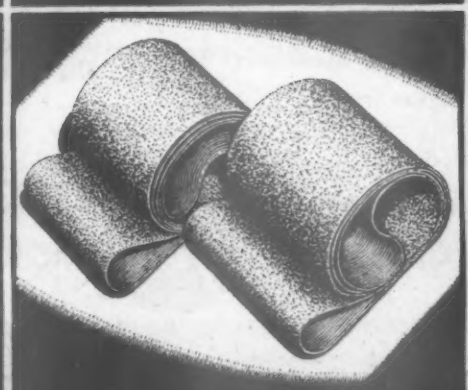
Specialized wheels by CARBORUNDUM for thread grinding

Diamond wheels to meet stiffer technical needs.

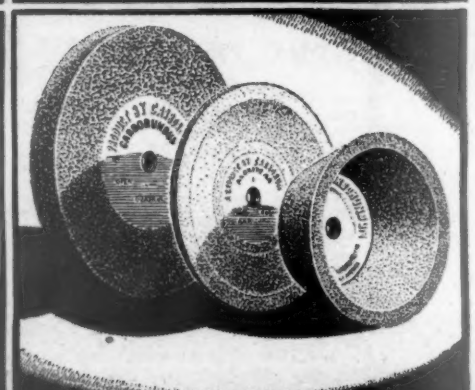
"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company.



Cool-cutting green grit wheels for cemented carbide.



A coated abrasive for every sanding and finishing condition.



All standard shapes are supplied in grinding wheels by CARBORUNDUM

"Conveyor System Saves $24,000 in first year!"

"Increases output in packaging dept. of large plant by 400% per man-hour!"

These statements were made by Mr. C. Lee Dryden, Chief Plant Engineer of the Signode Steel Strapping Company in Chicago . . . when he told about the solution of his serious materials handling problem.

THE PROBLEM

"Two slitter lines with a monthly production of 9,000,000 pounds of steel strapping were being bottle-necked. The shipping room had to be moved to another building over a block away in order to free plant area for a sudden increase in production schedules.

"This change added thousands of feet of trucking to an already overcrowded fleet of power trucks. And to complicate the problem, there was a transfer point where pallets had to be raised to a higher floor level through a hole in the wall of the second building."

Lamson Conveyor System Solves the Problem

"Two Lamson overhead conveyors now move coils from the distant slitter lines to the packaging department. At this point the coils are automatically transferred to two roller conveyor lines.

"Upender sends coils to whichever wrapping machine is ready for them. Stacking of coils on shipping pallets is completely automatic. Platform tilts when it reaches conveyor level, sends stack on its way down the rollers.

"*Entire operation is rapid, compact and self-regulating for even, steady flow. In the first year, the Lamson Conveyor System saved plant $24,000. The initial investment was returned during the first ten months of operation.*"

LAMSON CAN SAVE *You* MONEY

Let us know if you have a materials handling problem. Our nearest engineers will be glad to make an analysis and submit recommendations. *Write today.*

LAMSON CORPORATION

150 Lamson St. Syracuse 1, N. Y.

a way to get information to flow freely from the man on the machine to the top of the organization. Neither do we have a good exchange of information among individuals at the same level.

Use personal contact method in preference to written media.

Answer the questions in the minds of management members.

See that the management group is informed ahead of other groups on important subjects.

Educate members of management in the profession of management.

Promote management associations.

Encourage contacts with members of management in other companies.

Promote enrollment in courses on general management subjects.

ORDNANCE MOBILIZATION PROGRAM OUTLINED

Industrial preparedness was highlighted at a two-day meeting of the Army Ordnance Association in New York and Aberdeen, Md. More than 600 business executives heard leaders in ordnance planning activities propose the following mobilization policy improvements:

1. A new program of training production executives for economic mobilization by "taking the classroom to the factory."

2. Development of individual industrial mobilization plans within individual plants in advance of an emergency.

3. Integration of activities of local Army Ordnance Association groups with a larger scope of preparedness activities, envisaging services to the Navy Department and the Air Force, as well as the Army.

4. A change in the official name of the organization to a new title, "The American Ordnance Association," thus actively broadening the base of functions to provide for larger industrial participation and improved liaison with all our national defense activities.

5. Designation of a specific date, December 7 of each year, as a day dedicated by industrial production executives to dramatic display of ordnance accomplishments.

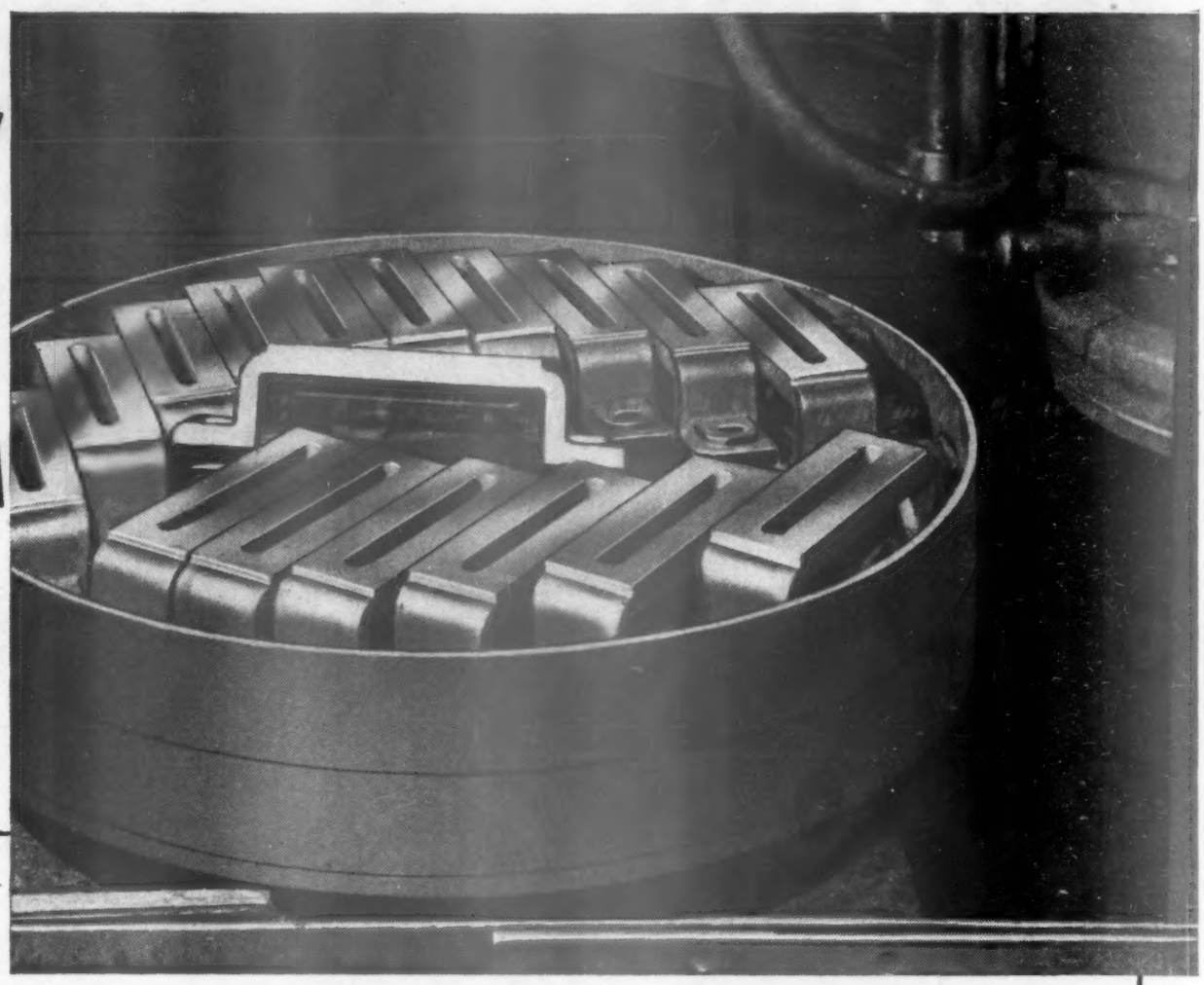
PRODUCTIVITY AT LOW POINT IN AUSTRALIA

McGRAW-HILL WORLD NEWS, Melbourne

Production per-man-hour in 1945-46 in Australia was lower than in any year since 1925-26. Real output per-man-hour in International Units was 0.540 in 1926, 0.636 in 1935, 0.608

6 REASONS WHY A BLANCHARD

"HOGGED" THIS JOB AWAY FROM A PLANER



THE JOB . . .

● The illustration shows 17 doffer drawing pulley brackets being held on a 36-inch chuck of a No. 18 Blanchard Surface Grinder. Material is cast iron. Rough size $15\frac{3}{8}''$ x $3\frac{1}{2}''$ x $3\frac{3}{4}''$. Two sides—the top and the feet—are ground, in two operations, to make the height $3\frac{7}{16}''$. Commercial finish required.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

1. Greater PRODUCTION: Previously planed in 43.8 minutes each. *Now Blanchard-Ground in 5.4 minutes each, or in* $\frac{1}{8}$ of the time previously required.

2. Saved a FIXTURE: Blanchard Grinding eliminates the use of a holding fixture previously necessary.

3. Saved MATERIAL: Blanchard Grinding permits less allowance for finish, and saves many pieces that would otherwise have been "salvage".

4. Greater FLATNESS:

5. Finer FINISH:

6. Closer LIMITS:

These are so effortlessly produced by Blanchard Grinding that—on jobs such as illustrated—you get all three of them as "by-products" from the use of:

THE MOST EFFICIENT METHOD OF PRODUCING FLAT SURFACES

Whether your grinding requires hogging cuts or light finish cuts, fine finish and/or extreme accuracy, avail yourself of Blanchard *Free Consultation Service*. Another Blanchard Service is *Sample Grinding* on which you pay only the transportation charges.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

TRACTION

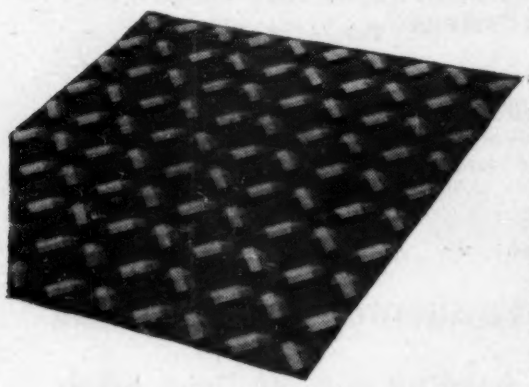
WET OR DRY

U·S·S Multigrip offers surer footing for workers... easier rolling for vehicles. It promotes foot comfort, lessens fatigue. Multigrip makes floors stronger and longer lasting. It provides easy cleaning and unobstructed drainage. There are no pockets in which dirt and water can accumulate. Installations are permanent, reducing plant maintenance cost.

Get further information about Multigrip from your nearest steel warehouse or write to us direct.

● VEHICLES ROLL EASILY

● SAFE, SURE FOOTING



● PERFECT MATCH AT EDGES

CARNEGIE-ILLINOIS STEEL CORPORATION
USS
MULTIGRIP
FLOOR PLATE
UNITED STATES STEEL

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
7-1211

UNITED STATES STEEL

in 1943, only 0.552 in 1946. The iron, steel, glass, and brick industries, however, have effected large savings in production costs as improved methods have overbalanced the declining labor efficiency.

NEW BUSINESS MACHINES A BOON TO MANAGEMENT

Many new applications of business machines were displayed at the National Business Show in New York recently. Among them are machines for:

1. Quality-control statistics.
2. Research mathematics and testing.
3. Time and motion study calculations.
4. Production cost accounting and payroll tax calculations.
5. Production bonus systems.
6. Purchasing and inventory control.

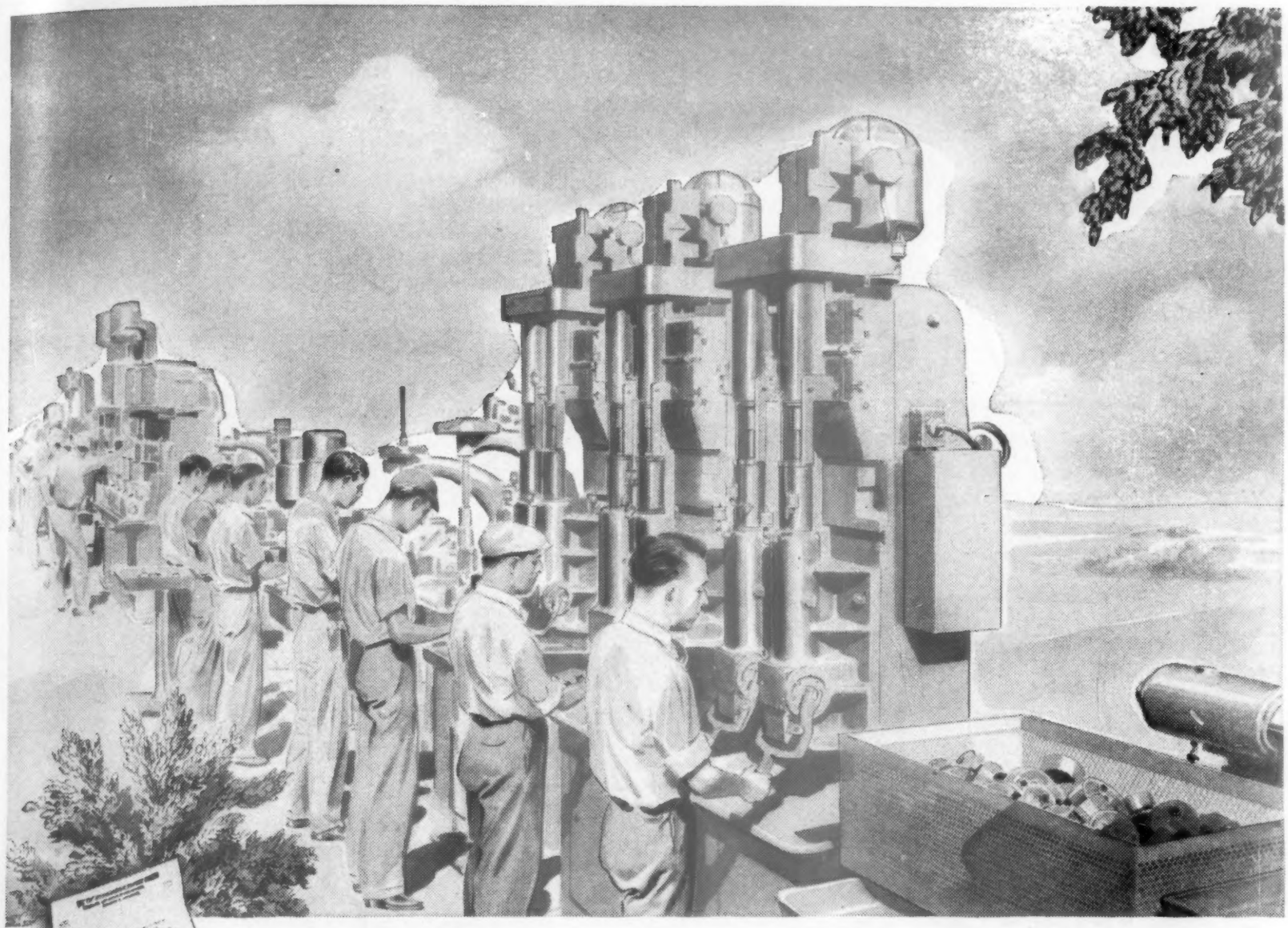
NLRB HEAD URGES LABOR LAW BACKING

PAUL HERZOG, Chairman, National Labor Relations Board, speaking before American Management Association

Management as a whole must discourage the few "short-sighted" employers who regard the Labor Management Relations (Taft-Hartley) Act of 1947 as a weapon to weaken labor. While it is the duty of labor to obey the new law, it is also the responsibility of business concerns to set a good example by bargaining collectively with employee representatives in good faith. Continuance of sound industrial relations is the best means of deterring a minority of companies that seek to use the Taft-Hartley Act in their own interest without regard for the unity and welfare of the country.

Management now holds the spotlight as labor did from 1925 to 1947. Public scrutiny of management's actions under the new statute will be supplemented from plant to plant by that of employees affected by any change in the company policy. The question will be "How is management using the new powers it has acquired by passage of the law?" and not merely "Are labor unions obeying the law?" The American people will insist that both questions are answered satisfactorily.

Fair dealing by most management in operating under the Taft-Hartley Act will have the effect of inducing labor to seek more harmonious industrial relations. Surely, management will want to recognize the im-



"Like moving your plant outdoors"

It took a lighting engineer to put into words the "lift" your workers will get from a clean, fresh coat of white paint on the ceilings and walls of your plant. Said he, in describing a job recently done in one plant with Barreled Sunlight:

"It's like moving your plant outdoors!"

He's right, too—for white ceilings and walls create an "indoor sky" which reflects and diffuses the light from your fixtures exactly as the sky reflects and diffuses natural sunlight.

This means greater lighting efficiency, *for white paint reflects far more light (80 to 90%) than paint of any other color.* And it means better seeing — the answer to greater productivity—because by distributing the light evenly it helps banish the glare, harsh shadows and extreme brightness contrasts which make seeing difficult.

But "any old white" won't do. If painting is to be a *sound investment* the white you buy must be easy to apply on large areas, give you good "yardage" without loss of hiding power and *remain* white for the longest possible time. That's why for years so many of America's leading plants have standardized on BARRELED SUNLIGHT.

U. S. GUTTA PERCHA PAINT COMPANY
2-K Dudley Street, Providence 1, R. I.

I'd like to know more about the partnership of Light and Paint. Please send me your free 32-page booklet, "Light and Color in the Work-World."

COMPANY .....

STREET AND NUMBER .....

CITY ..... ZONE ..... STATE .....

MY NAME IS .....

MY TITLE .....

© 1947 U. S. Gutta Percha Paint Company

Hillyard FLOOR TREATMENTS

SAVE

WOOD

FLOOR

TILE

TERRAZZO

CEMENT

LINOLEUM

ASPHALT TILE

Hillyard Floor Treatments SAVE all types of floors in every type of Institution . . . they are Uniform, Dependable, and Economical, and bring out the natural beauty of every type floor.

Send for our new FREE book "Floor Job Specifications" full of helpful hints on economical floor manintenance.

HILLYARD SALES CO's

DISTRIBUTORS

HILLYARD CHEMICAL CO. ST. JOSEPH, MO.

470 Alabama St., San Francisco, Calif.
1947 Broadway, New York, N. Y.

plications of this challenge by advocating and practicing restraint. By your example you are most likely to encourage similar restraint by labor, thereby assuring national unity in a period when America must play a strong part in a troubled world. The National Labor Relations Board emphatically invites both unions and management to use its services. However, man-made law can never substitute for good labor relations.

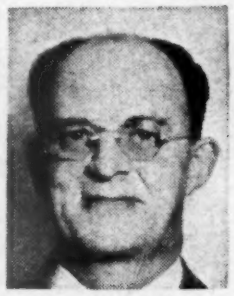
EMPLOYERS FILE ONLY 10 PER CENT OF T-H LAW CASES

Nearly 90 per cent of the cases filed with the NLRB between August 22 and September 30 under the Taft-Hartley Law were filed by employes and unions. Such disparity was unexpected, since management's rights were broadened under the Act and many unions have been barred from using the board's facilities because of failure to comply with non-Communist affidavit requirements.

Cases pending as of September 30 numbered 4036. Most were filed under the Wagner Act.

BEHIND THE BYLINE

Facts About FACTORY'S Authors



Frank X. Droege (page 72) has been a member of the Crosley Division, Avco Manufacturing Corporation, for 21 years. From 1928 until 1943 he was a timestudy engineer. At present he is supervisor of standards. Earlier jobs included that of service manager in a radio shop, electrician for a power company, and machinist for a railroad. Droege is a graduate of St. Xavier University and the Chicago Engineering Works.

Alan J. Woodfield (page 74) studied industrial engineering at New York University. Has been with Continental Paper Company in charge of industrial engineering and personnel re-

I have a REZNOR in my office, too!

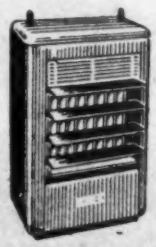
Automatic, gas fired Reznor floor and suspended type heaters keep homes, apartments, offices, factories, warehouses, garages, stores, restaurants and auditoriums warm ECONOMICALLY.

it has a BIG, QUIET FAN

Abundance of warm air moves through a "special" heat exchanger by means of A BIG, QUIET FAN. Eliminate heating cares with Reznor handsome, *automatic,* gas fired, easy-to-install heaters. Write today.

REZNOR

Gas fired unit heaters



SUSPENDED OR FLOOR MODEL

A SIZE FOR EVERY NEED ✓

REZNOR CO.
MERCER, PENNA.
Gas Heaters Since 1888

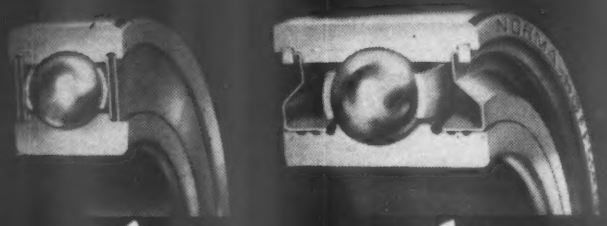
NO BOILERS · NO STEAM LINES
NO FUEL STORAGE · NO FIRE TENDING

"If it isn't Wide Enough It isn't Good Enough"

...TO MEET TODAY'S PROBLEMS

GET 3 DESIGN BENEFITS WITH

NORMA-HOFFMANN "CARTRIDGE" BEARING



CONVENTIONAL Single Row Width sealed bearing has small grease capacity.

NORMA-HOFFMANN patented double row width "Cartridge" Bearing has 100% greater grease capacity.

Patented

Here's What You Get

1. **Longer Life** A 100% greater grease capacity than conventional width sealed bearings. This means longer grease life... longer periods between relubrication—because a large volume of grease does not oxidize or dry out as readily as a thin film of grease.
2. **Greater Contact Area** 43% to 85% greater contact area between shaft and bearing bore and between housing and bearing O.D., as compared to conventional width bearing. This eliminates need for locknuts and results in greater shaft strength as it is unnecessary to cut locknut threads. Slippage and peening are also prevented.
3. **Full Load Carrying Capacity** Unlike many other sealed bearings, ***full size*** balls are used; hence, there is no reduction in load carrying capacity.

America's No. 1 SEALED BEARING by NORMA-HOFFMANN

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONNECTICUT

FIELD OFFICES: New York, Chicago, Cleveland, Detroit, Pittsburgh, Cincinnati, Los Angeles, San Francisco, Seattle, Phoenix

Haunted by supply problems?

Solve 'em by Air Express!

Don't let low stocks or distant supply points scare you! With Air Express cutting delivery time down to a matter of hours, you can get what's needed from anywhere in a rush. Just remember to specify Air Express. Your shipment flies to you at speeds up to 5 miles a minute. Air Express goes on all flights of all Scheduled Airlines — that means the fastest possible service.

Use Air Express regularly. You'll find there's real profit for you in such speedy service. And rates are *low*. Frequent flights to and from points overseas can simplify your foreign shipping problems, too. Investigate.

Specify Air Express-it's Good Business

- Low rates—special pick-up and delivery in principal U.S. towns and cities at no extra cost. • Moves on all flights of all Scheduled Airlines.
- Air-rail between 22,000 off-airline offices.
- Direct air service to and from scores of foreign countries.

Just phone your local Air Express Division, Railway Express Agency, for fast shipping action . . . Write today for Schedule of Domestic and International Rates. Address Air Express, 230 Park Ave., New York 17. Or ask for it at any Airline or Railway Express Office. Air Express Division, Railway Express Agency, representing the Scheduled Airlines of the United States.

AIR EXPRESS

AIR EXPRESS

GETS THERE FIRST

Fastest delivery — at low rates

Machine parts (75 lbs.) in Chicago were needed by a bottling works in Dallas *fast*. Picked up 10 AM the 6th, delivered same day at 5:05 PM. 795 miles, Air Express charge only $18.42. Other weights, any distance, similarly inexpensive and *fast*.

BEHIND THE BYLINE *(continued)*

lations since 1945. Before that he worked for Beecher Falls Manufacturing Company, Ordnance Branch, U. S. Army, and Sylvania Electric Products, Inc. Holds membership in the American Management Association, Society for Advancement of Management, National Industrial Conference Board, and the Town Hall Club.

H. L. Disco (page 80), superintendent of the refrigerator unit division at General Electric Company, began apprenticeship with the company in 1916. Between 1925 and 1936, when he became superintendent on the locomotive division, he advanced steadily from the job of tool and die maker. Became superintendent of the gun mount division in 1940. The war years found him in charge of various war production divisions. Fishing is his favorite hobby.

Fritz Albrecht (page 84) completed his formal education at the University of Munich, settled in the United States in 1926. While working for the Radio Corporation of America he traveled abroad extensively. In 1937 he joined The Glenn L. Martin Company as a welding engineer. During the war he taught electronics at Johns Hopkins. He is chairman of the welding subcommittee of the Aircraft Research and Testing Committee of the Aircraft Industries Association. Gardening is his hobby—he specializes in growing rare herbs.

Sidney Reibel (page 105) is materials handling consultant for Albert Kahn Associated Architects & Engineers. Since graduation from Rose Polytechnic Institute in 1921, he has devoted his time and efforts to the design

"...sooner than you thought!"

The Prompt, Willing, Cheerful and Fair Payment of Claims is a Record-Making Policy of Employers Mutuals of Wausau

The Employers Mutuals claim adjuster is hand-picked for his inherent capabilities and is company-trained in the cheerful, cooperative settling of claims. Therefore he is able and eager to protect the interests of the policyholders who own these fine mutual companies.

His success is attested, year after year, by many state insurance records which show Employers Mutuals of Wausau at or near the top of the list of all insurance companies for prompt payment of claims.

When you, as an individual or as a business executive, buy insurance, you rightly expect to be certain that you will be paid promptly, cheerfully and fairly for any loss you may experience.

Employers Mutuals recognize the importance of their obligation and especially so since their policyholders are "partners" in the business.

These companies—because of their carefully planned, skilfully executed, humanitarian services which save lives, prevent accidents, and reduce industrial disease—safeguard you and your property from legal liability and loss, reduce your insurance costs and cement good relations in every phase of personal and business contacts. Employers Mutuals handle policyholders' insurance affairs as policyholders would like them to be handled.

Contact the Employers Mutuals Man in your vicinity for a complete explanation of Workmen's Compensation . . . Public and Personal Liability . . . Group Disability (Health, Accident, Hospitalization and Surgical Benefits) . . . Fidelity Bonds . . . Burglary . . . Plate Glass . . . Automobile and other casualty insurance . . . Fire . . . Tornado . . . Extended Coverage . . . Inland Marine and allied lines of insurance. All these policies are nonassessable.

Did you know that *one* convenient policy can protect your business against every type of loss from theft, robbery, fraud, or dishonesty? A new booklet, "For Your Better Understanding of Comprehensive Protective Crime Insurance," which shows you how such a policy can be tailored to fit your needs, will be sent upon your business letterhead request. If you wish, we will also send you a copyrighted "Dictionary of Insurance Terms"—available only from Employers Mutuals of Wausau.

EMPLOYERS MUTUALS OF WAUSAU

. . . make insurance understandable

YOU GET AIR ECONOMICALLY IN YOUR PLANT *anywhere*

Schramm Air Compressors can be easily installed as a unit system in plants requiring varying compressor loads and Schramm's Automatic Control makes it possible to operate them singly or in units as varying air requirements demand.

Schramm features are distinct: 100% water cooled . . . Forced feed lubrication . . . Mechanical intake valve . . . lightweight, compact, *vibrationless*. There are many compressed air jobs in plants that are ably done by Schramm.

Stationary Schramm Compressors range in size from 2 to 600 cu. ft. displacement. For construction jobs around your plant there are portable units. Regardless of your compressed air need, there is a Schramm Air Compressor available to do the work.

Write us today for complete literature.

SCHRAMM INC. THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA

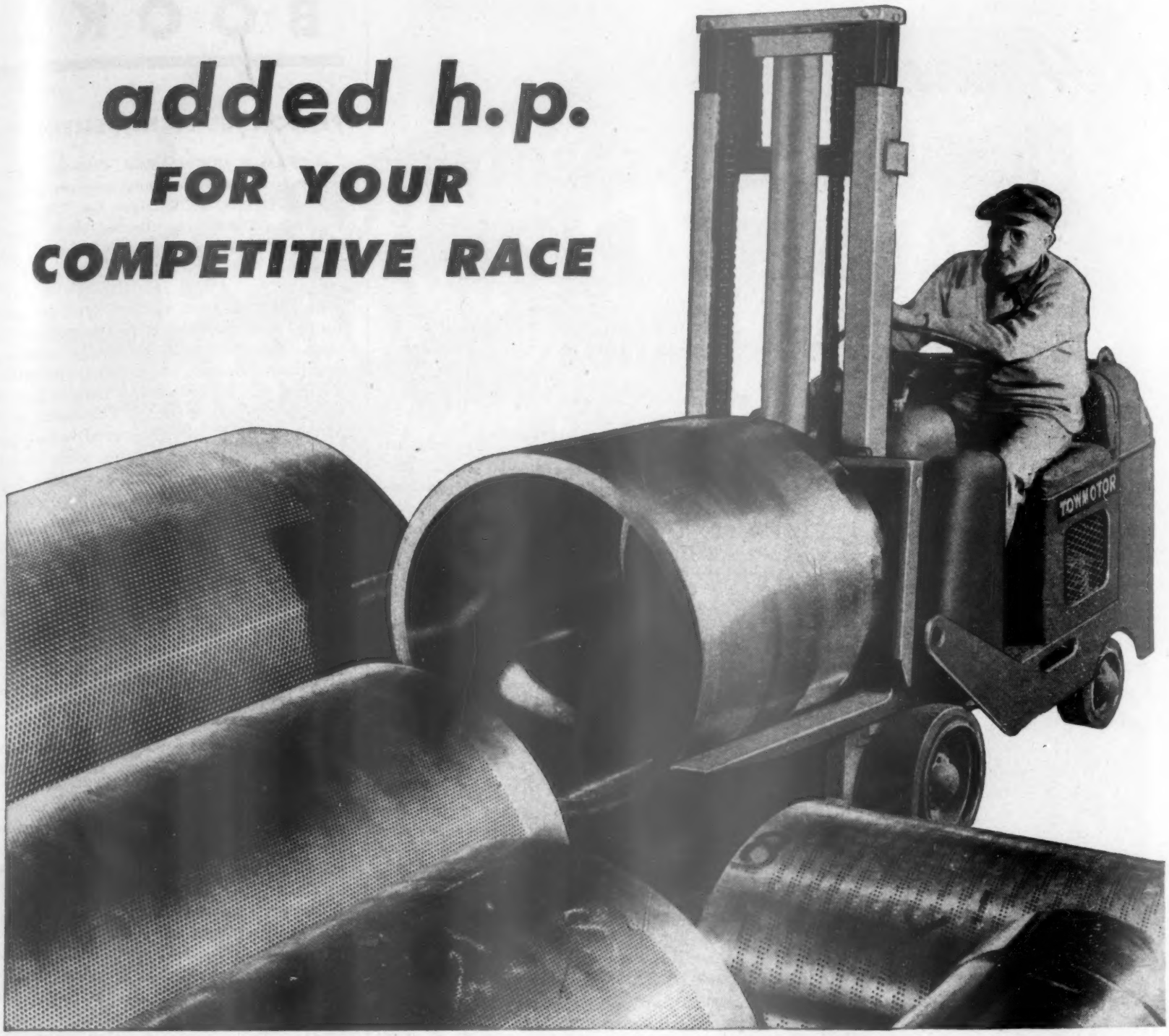
and application of materials handling equipment. He has designed the world's largest metal chip handling and storage system, a 12-way valve for pneumatic conveyors, and high-capacity low-speed conveyors for handling magazines in printing plants. He frequently writes for technical publications, and in 1946 presented a paper on materials handling at the annual meeting of the ASME.

Parker C. Williams (page 117) received his A.B. degree from Johns Hopkins University, and an L.L.B. degree from Harvard Law School. He practiced law in Cleveland, and for a number of years lectured on equity and labor law at the Lake Erie School of Law and the Cleveland Law School. He has been with the White Motor Company since 1942 and is now director of industrial relations.

Henry S. Godshall, Jr. (page 120) was assistant athletic director at Cornell University after graduation. He joined Scott Paper Company in 1939, worked first as a clerk in maintenance, and then as assistant chief cost accountant. Served as an Ordnance specialist in the Navy. Was released in 1945 as Lieutenant Commander. Returned to Scott Paper as maintenance engineer. His hobby is coin collecting.

Frank M. Brandon (page 129) started his woodworking career with Cron-Kills Company. In 1928 he left Cron-Kills as assistant superintendent to become general superintendent of the Wilson Furniture Company. Consider H. Willett, Inc., absorbed Wilson, and in 1934 Brandon became superintendent of Willett. In 1947 he was made vice-president in charge of production. His only hobby is raising and riding horses.

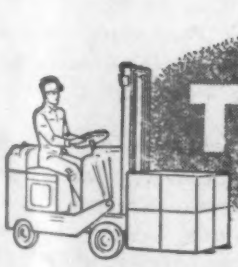
added h.p.
FOR YOUR COMPETITIVE RACE



TUNE UP your production machine for the competitive race, and let Towmotor Fork Lift Trucks and Accessories provide the added horsepower that will keep you out in front. With Towmotor maintaining a scheduled flow of materials between every phase of operation, your production machine will function smoothly and swiftly . . . you'll get maximum output at minimum cost.

There's a Pocket Catalog that lists the complete line of Towmotor Fork Lift Trucks and Accessories . . . send for your copy today. Towmotor Corporation, Division 5, 1226 East 152nd Street, Cleveland 10, Ohio.

SEND FOR SPECIAL BULLETINS DESCRIBING THE TOWMOTOR REVOLVING CARRIAGE • SIDE SHIFTER UNLOADER • UPENDER • SCOOP • CRANE ARM • EXTENSION FORKS • EXTENSION BACKREST • RAM • OVERHEAD GUARD



TOWMOTOR THE ONE-MAN GANG **FORK LIFT TRUCKS *and* TRACTORS**

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

4 reasons why...

Plant Engineers specify TRANSITE PIPE for water lines

WATER *STAYS* CLEAN...because Transite Pipe is made of two materials that cannot rust—asbestos and cement. This pipe never causes "red water" or rusty scale.

DELIVERY *STAYS* HIGH . . . because the smooth, non-metallic interior of Transite is immune to tuberculation. Transite's high carrying capacity (C=140) can never be reduced by this troublesome form of internal corrosion. This helps keep pressures high, pumping costs low.

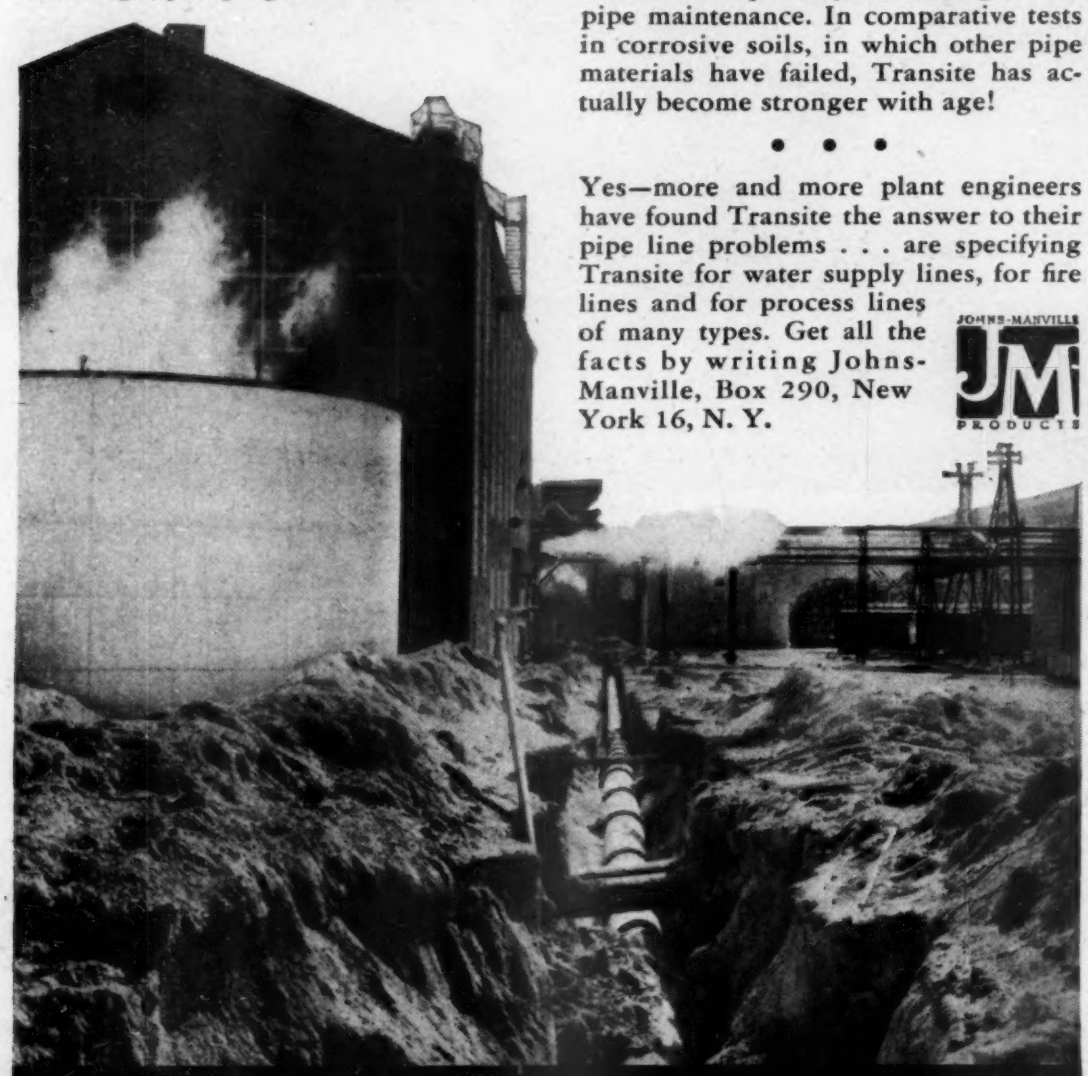
JOINTS *STAY* TIGHT . . . because of Transite's Simplex Coupling. This factory-made coupling is simply *assembled* on the job, providing a joint which is both tight and flexible. It safeguards against underground leakage; its flexibility helps compensate for soil stresses and the vibrations of heavy traffic.

MAINTENANCE *STAYS* LOW... because Transite is exceptionally resistant to soil corrosion—a primary cause of high water pipe maintenance. In comparative tests in corrosive soils, in which other pipe materials have failed, Transite has actually become stronger with age!

• • •

Yes—more and more plant engineers have found Transite the answer to their pipe line problems . . . are specifying Transite for water supply lines, for fire lines and for process lines of many types. Get all the facts by writing Johns-Manville, Box 290, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS



Johns-Manville

TRANSITE PRESSURE PIPE

An Asbestos Product

for Water Supply Lines • for Fire Lines • for Process Lines

BOOKS

PERSONNEL MANAGEMENT

MICHAEL J. JUCIUS, Ph.D., Professor of Business Organization, Ohio State University. Richard D. Irwin, Inc., 332 So. Michigan Ave., Chicago 4. 696 pages. Photographs, sketches, charts, tables, graphs, sample forms, appendix, reading list, index. $6.

Major problems encountered in personnel management are discussed in this book, together with generally accepted solutions. Examples of good practices worked out in industrial firms are cited to illustrate these topics. The entire field of personnel work is covered, with particular emphasis on details such as job and labor requirements, screening and interviewing employees, training, evaluating both jobs and employees, discipline, grievances, collective bargaining, and research on and control of personnel functions. The development, maintenance, and effective use of employees as a working team is outlined.

UNION-MANAGEMENT COOPERATION

KURT BRAUN. The Brookings Institution, Washington, D. C. 259 pages. Tables, charts, index. $3.

Subtitled "Experience in the Clothing Industry." The conditions under which union-management cooperation may be developed are discussed and analyzed in this volume. The clothing industry, one of the groups in which such cooperation has been developed to a high degree, has been used by the author as an example to bring out the problems involved. Harmonizing the traditional views of management functions with customary union policies is discussed at length, as are collaboration in wage, profit, price, employment, and welfare matters. Joint plans to regulate business fluctuations, trade practices, and to improve efficiency, sales, and industrial peace are also included, as well as the significance of the success of many of these cooperative schemes on industry as a whole.

TEXTBOOK OF THE MATERIALS OF ENGINEERING

HERBERT F. MOORE, Research Professor of Engineering, Emeritus, Engineering Experiment Station, University of Illinois, with chapters by HARRISON F. GONNERMAN, JASPER O. DRAFFIN, and WILLIAM N. FINDLEY. 7th edition. McGraw-Hill Publishing Co., 330 West 42nd St., New York 18. 500 pages. Photographs, sketches, diagrams, charts, graphs, tables, formulas, appendix, list of visual aids, index. $5.

This latest edition of a text used for 30 years in engineering classes places primary emphasis on stress-carrying materials, structure of metals, wood, concrete, and plastics. New materials developed during the war are reported, together

Eliminate DAMAGING WATER and OIL from Your Compressed Air Lines

With

ADAMS AFTERCOOLERS and CYCLONE SEPARATORS

Air Cooled to Within 10 DEGREES of Cooling Water! EASILY INSTALLED! Pipeline Construction

ADAMS equipment insures a constant supply of cool, moisture-free, oil-free air to power your compressed air tools with the highest efficiency and safety . . . at the *lowest* installation and maintenance cost.

ADAMS AFTERCOOLERS are *guaranteed* to cool air to *within 10 degrees* of your cooling water. This means *extra* thoroughness in condensing water and oil vapors from your compressed air.

NO FOUNDATION or other facilities are required for installation. The Adams "pipeline" construction permits the After cooler and Cyclone Separator to fit right into a section of the pipe line . . . either vertically or horizontally!

CYCLONIC SEPARATION is the Adams principle . . engineers agree that it is *far more efficient* than other mechanical separation!

WRITE!

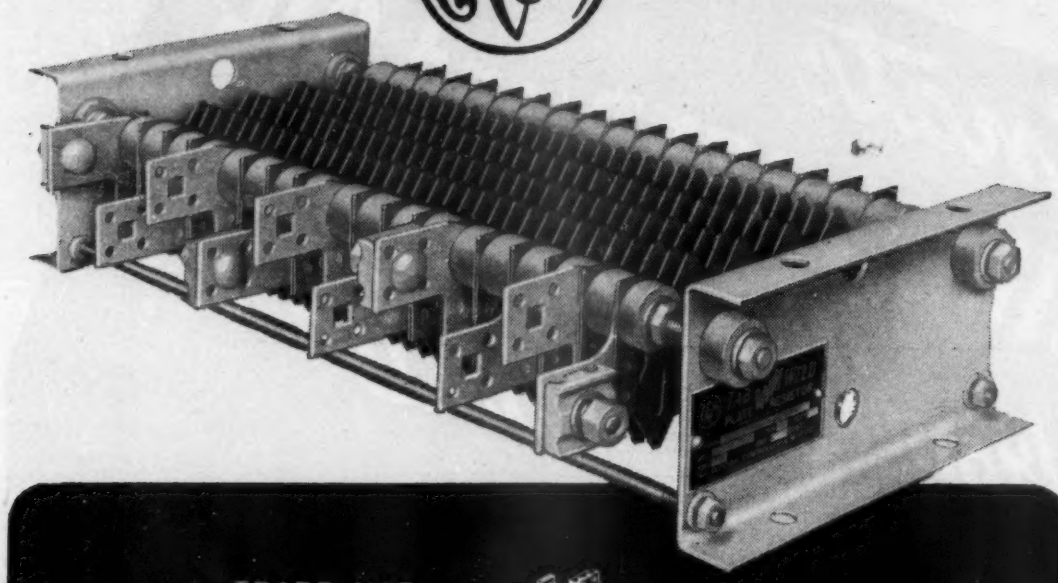
today for full engineering data on improved pneumatic power performance. Ask for Bulletin 703.

R. P. ADAMS CO., INC.

215 East Park Drive **Buffalo 17, N.Y.**

ADAMS AFTERCOOLERS and CYCLONE SEPARATORS

A New E&M Product



TRADE MARK

TAB WELD PLATE RESISTORS

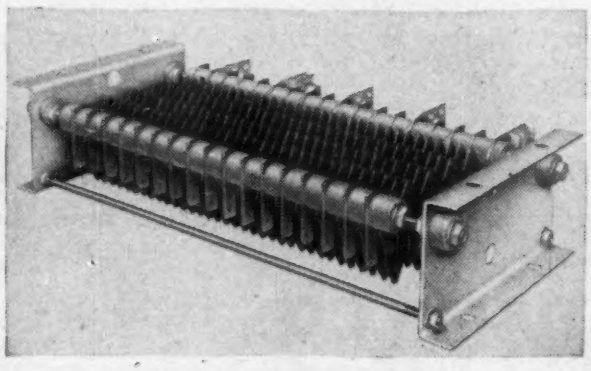
For CONTROLLER and STARTER DUTY

A continuous path from end to end by spot-welding—Terminal-plates for external connections also welded in place.

THESE are non-breakable Resistors having Tab-Weld construction. The grids are stamped from flat-rolled, corrosion-resistant, chromium alloy steel. Off-setting the end-convolutions brings the grid-eyes of adjacent resistors into intimate contact on one side of the section and separates them on the opposite side. High dielectric spacers, used between the separated ends, retain their shape under pressure and will not soften at maximum temperatures.

Tabs at the end of each resistor extend below the grid-eyes and supporting rods. Terminal-plates, placed on the rod at frequent intervals against the mated resistor-ends on one side of the section also have tabs to match with the resistor-tabs. All adjoining tabs are spot-welded together.

Terminal clamp-blocks, having grooves to accommodate several sizes of wire, are bolted to the terminal-plates and are readily movable from plate to plate to provide the desired resistance per step. If flat-bus is preferred for external connections, it may be bolted on by the four holes supplied in each terminal-plate.



New Bulletin 942 completely describes these TAB-WELD Plate Resistors. A copy will be sent promptly on request.

OUTSTANDING ADVANTAGES

NO burning at grid-eyes ● NO burning at taps ● NO periodic tightening of clamping-nuts ● Accurately moulded insulating spacers will not soften below 2000° F. ● Negligible resistance-change between cold and maximum working temperatures ● Grid-stack clamped independently of end-frame clamping. Accurate mounting dimensions maintained regardless of grid-stack length ● All sections of the same width, length and height. The same size resistors used throughout standard mill sections.

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79th STREET • CLEVELAND 4, OHIO

with processing methods for each, and testing machines and methods are also included. Formulas in common use for determining stress are presented in the appendix.

BUSINESS PLANNING AND CONTROL

FLOYD H. ROWLAND, Management Consultant; Vice President, Associated Development and Research Corporation. Harper Brothers, 49 East 33rd St., New York 16. 337 pages. Sketches, charts, tables, bibliography, index. $4.

Techniques used in solving the problems facing top management today are analyzed here, as they are affected by modern business organization and control. Divided into two parts, the book first outlines the factors in product selection, market forecasting, sales methods, and production plans. The second takes up budgetary control, organization procedures, and personnel policy.

AIR CONDITIONING

HERBERT HERKIMER and HAROLD HERKIMER. Chemical Publishing Co., Brooklyn, N. Y. 692 pages. Sketches, diagrams, charts, tables, formulas, appendix, index. $12.

Specific information useful to engineers and students of air conditioning is listed here. Estimates, sales, promotion, installation, supervision, and service are included, as well as a discussion of the basic laws of chemistry and physics associated with this field.

INDUSTRIAL MANAGEMENT

WILLIAM R. SPRIEGEL, Professor of Industrial Management; Chairman, Department of Management, School of Commerce, Northwestern University, and **RICHARD H. LANSBURGH.** 4th edition. John Wiley & Sons, New York, 656 pages. Photographs, sketches, charts, sample forms, tables, diagrams, appendixes, index. $5.

Policies and principles of successful management and the devices used to carry them out are here presented. Emphasis is placed upon the relationships and interdependence of the various major departments of a business. New material on maintenance, and many new illustrations, selected from a variety of industries, have been added to this latest revision of a text used for many years.

ILLUSTRATED JIG-TOOLING DICTIONARY

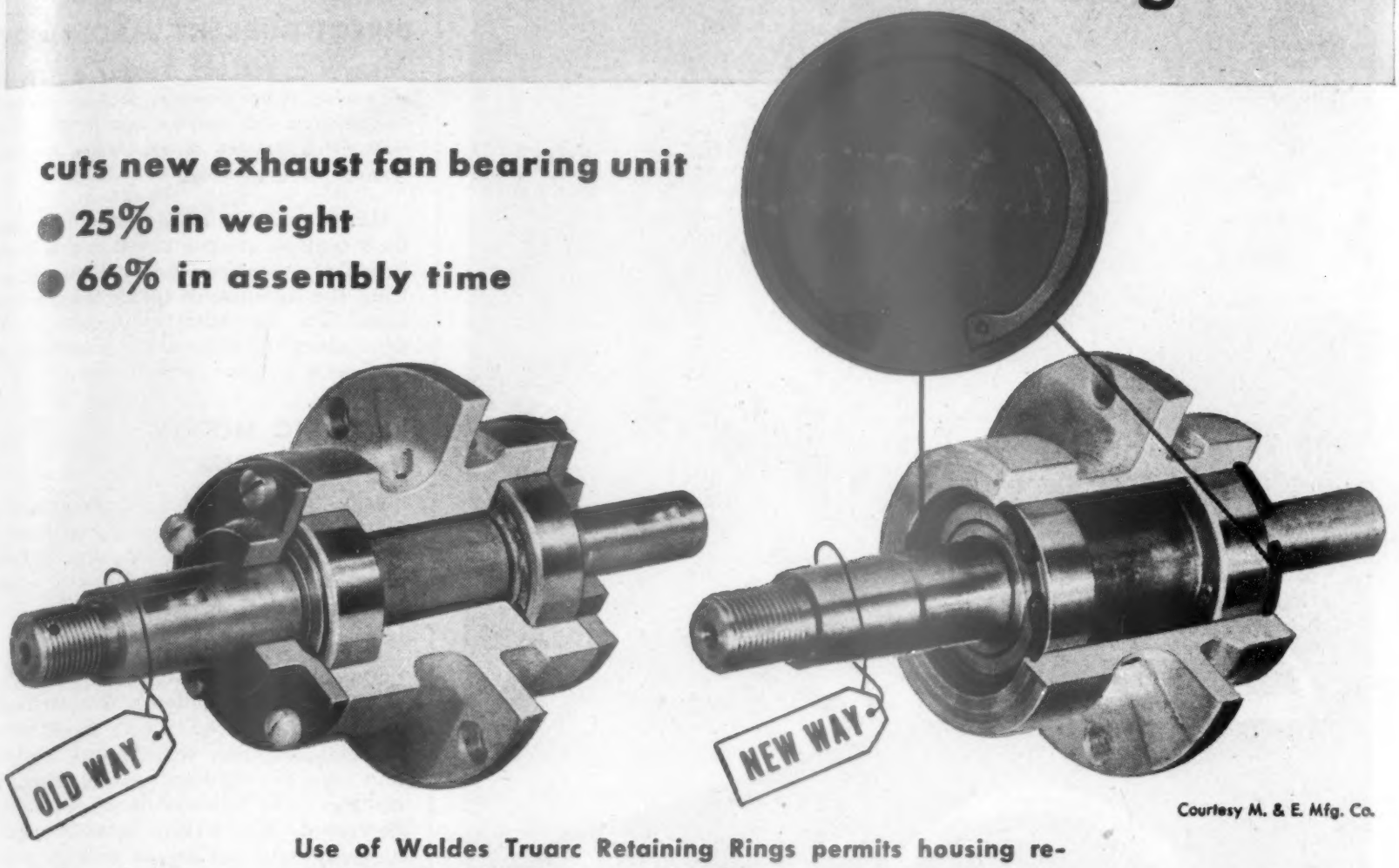
TORGER G. THOMPSON and **ROSS A. PETERSON.** The Macmillan Co., 60 Fifth Ave., New York. 349 pages. Sketches, tables, appendixes 1 through 27. $7.50.

Factual data, useful to toolmakers, tool engineers and designers, is presented here alphabetically, each item illustrated with a sketch. In addition to all terms referring to tools, parts, and operations, many allied terms and procedures are included, such as mathematical procedures, formulas, properties and treatments of metals, standard and basic

TRUARC trims 13 minutes machining to 6

cuts new exhaust fan bearing unit

- **25% in weight**
- **66% in assembly time**



Courtesy M. & E. Mfg. Co.

Use of Waldes Truarc Retaining Rings permits housing redesign—eliminates heavy cast bearing caps and screws requiring drilling and tapping; lowers labor and material cost.

"TRUARC PAYS DIVIDENDS IN SAVINGS!" declares M. & E. Manufacturing Company, of Indianapolis, makers of exhaust fans for industry. "Improvements in design made possible by Waldes Truarc Retaining Rings provide a quieter, freer-running assembly, assure longer life to the entire unit, eliminate the hazards of uneven unnecessary pressure on the bearing and minimize future service requirements. In our experience Truarc has definitely proved itself the better method for doing an important job."

Truarc does a better job on axles and shafts for retaining and positioning wheels, pulleys, cams and gears. In widely varied applications, designers find its never-failing grip, its patented design that assures constant circularity, make Truarc the better way to hold machine parts together. Production and maintenance men in many industries see how Truarc rings cut costs sharply, maintain accurate, unvarying relationship of parts. Send us your drawings; Waldes Truarc engineers will be glad to show how Truarc can help you.

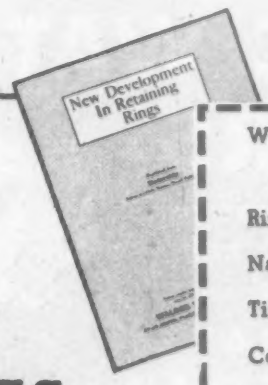
WALDES

TRUARC

U. S. PATENT RE. 18,144

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK



● *Send for new Truarc booklet, "New Development In Retaining Rings"*

Waldes Kohinoor, Inc., 47-10 Austel Place 19-U
Long Island City 1, N. Y

Please send booklet, "New Development In Retaining Rings" to:

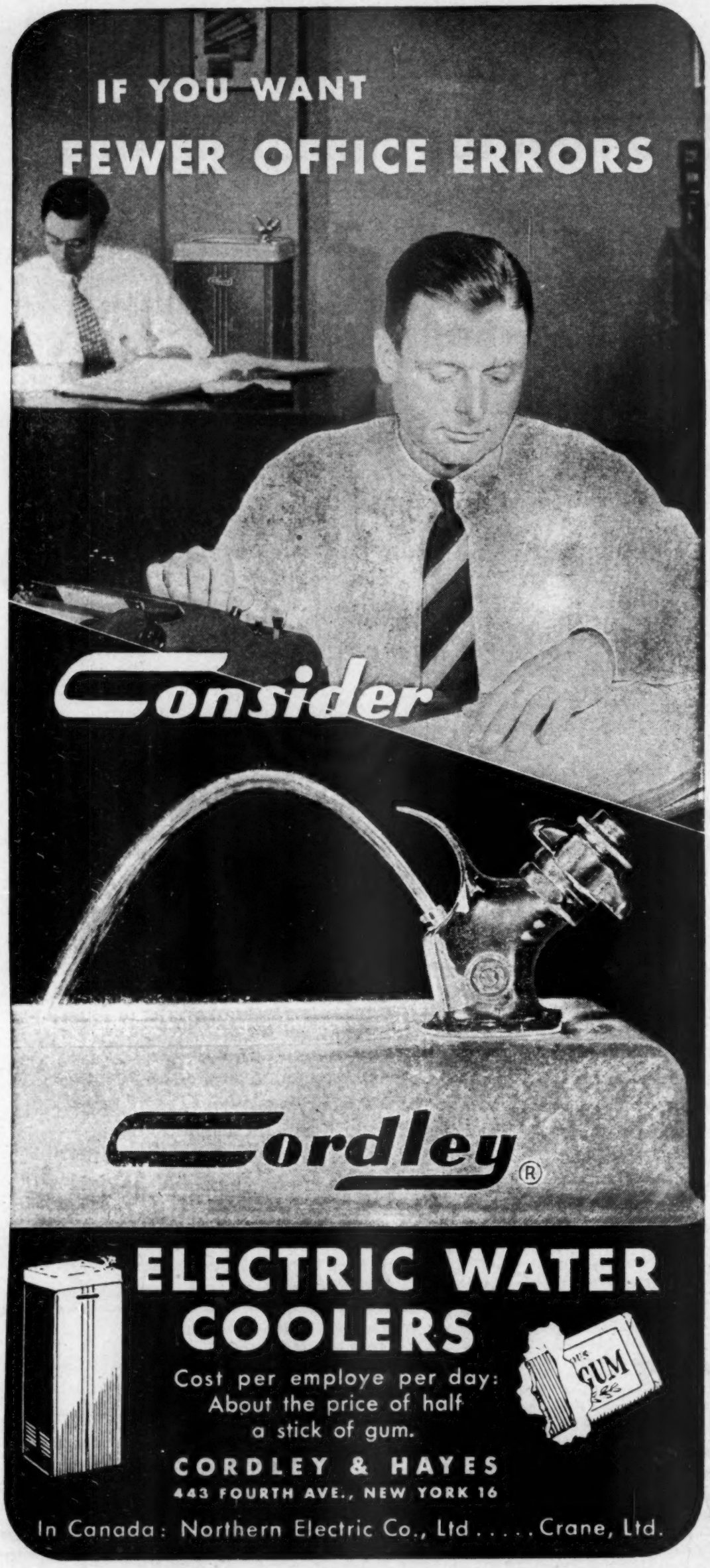
Name_____

Title_____

Company_____

Business Address_____

City_____ Zone_____ State_____


IF YOU WANT
FEWER OFFICE ERRORS
Consider
Cordley®
ELECTRIC WATER COOLERS
Cost per employe per day:
About the price of half
a stick of gum.
CORDLEY & HAYES
443 FOURTH AVE., NEW YORK 16
In Canada: Northern Electric Co., Ltd . . . . . Crane, Ltd.

dimensions, and special terminology used in individual industries.

Particular attention is paid to precision equipment, stressing their specific functions, proper use, and methods of obtaining and interpreting calibration results. Typical tooling procedures are illustrated and explained by drawings.

DIRECT-CURRENT MACHINERY

GROVER C. BLALOCK, Professor of Electrical Engineering, Purdue University. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 367 pages. Photographs, sketches, graphs, tables, formulas, diagrams, list of visual aids, index. $3.75.

Basic and specialized machines and their controls are portrayed in this book. Practical examples and problems illustrate the significance of the theory outlined. The operating characteristics of generators and motors are presented, as well as a chapter on batteries.

ELECTRIC MOTOR MAINTENANCE

W. W. McCULLOUGH, District Manufacturing and Repair Department, Westinghouse Electric Corp. John Wiley & Sons, Inc., New York. 126 pages. Photographs, sketches, diagrams, graphs, formulas, sample forms, index. $2.

Subtitled "A practical, detailed book for mechanics, supervisors, electricians, plant engineers, students." Construction of various types of motors is discussed in detail, together with testing methods and tools required for testing. The procedures to be followed in inspection are described, and a full account of the cleaning and drying of motors is included.

PRINCIPLES AND PRACTICE OF ELECTRICAL ENGINEERING

ALEXANDER GRAY, Late Professor of Electrical Engineering, Cornell University; revised by **G. A. WALLACE,** Professor of Electrical Engineering, McGill University. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 568 pages. 6th edition. Photographs, sketches, diagrams, charts, formulas, appendix, list of visual aids, index. $4.

An outline of electrical engineering intended for students not specializing in, but who need a thorough working knowledge of the subject. This revision expands and brings up to date material on 3-phase circuits, transformer theory and connections. Definitions have been altered to conform with AIEE standards, and a mathematical treatment of the explanation of the growth and decay of a current has been added.

PRINCIPLES OF ECONOMICS

ALBERT E. WAUGH, Professor of Economics, University of Connecticut. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 934 pages. Tables, graphs, charts, mathematical appendix, index. $4.50.

The description of important economic institutions, phenomena, and problems presented here furnishes a basis for understanding the nature of the econo-

...give it a Carey-spray

"CAREY-SPRAY" means better roof maintenance for you! With recently developed high pressure spraying equipment, Carey Roof Coatings and Cold Process Roof Cements are now applied to all types of roof jobs.

THAT'S "CAREY-SPRAY"

This faster way is a better, cleaner way. It gives you a uniform coating with a minimum of muss and fuss in a minimum of time. It gets the job done . . . instead of half finished . . . "while the sun shines." The spray method takes Carey Coatings from the original container direct to the roof. No fussing with broom and hoist—no lugging of pails. A truck-mounted Alemite Versatal Spray unit merely drives to the job-site and goes to work. It's as simple as that!

NOW you can "Carey-Spray" your roofs with such time-proved products as Careyclad Coating, Carey Fibercoating, Flextop, Enamelclad and Carex Coating. Now, too, you can have a Carey Cold Process Built-up Roof applied, without heat or brush, by Alemite Versatal Spray methods. To take advantage of Carey's more than 50 years experience in roofing and roof maintenance, call your nearest Carey Approved Roofer or write direct.

LOOK AT THESE "CAREY-SPRAY" *features!*

- ✔ Complete, uniform coverage
- ✔ Quick, easy, clean application
- ✔ Efficient—no hoists, no mess, no clutter. All spraying equipment is on one truck.

results ...tight job, good seal, minimum cost

Carey

THE PHILIP CAREY MANUFACTURING CO., CINCINNATI 15, OHIO

In Canada: The Philip Carey Co., Ltd.
Office and Factory: Montreal 25, P. Q.

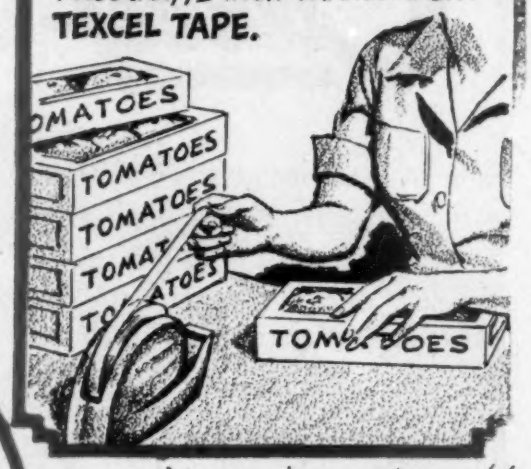
Industrial Insulation • Rock Wool Insulation
Careyduct • Asbestos Wallboard & Sheathing
Asphalt Shingles & Roofings • Built-up Roofing
Roof Coatings & Cements • Pipeline Felt
Asphalt Tile Flooring • Waterproofing Materials
Expansion Joint • Asbestos Shingles & Siding
Corrugated Asbestos Roofing and Siding
Miami-Carey Bathroom Cabinets & Accessories

SPEEDY SHORTCUTS

THAT SAVE TIME, WORK, MONEY WITH PERMACEL INDUSTRIAL TAPES!

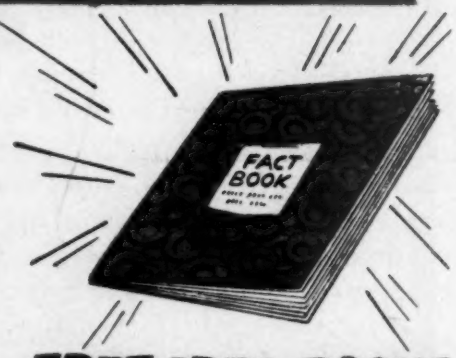
A **MILLING COMPANY** PACKS ITS FLOUR BAGS IN CORRUGATED CARTONS SEALED WITH **PERMACEL-99** ACETATE FIBRE TAPE. THIS INSURES A DUSTPROOF, WATER-REPELLENT PACKAGE, IMPOSSIBLE TO OBTAIN BY GLUEING.

A **PRODUCE FIRM** PACKAGES TOMATOES IN CELLOPHANE-WINDOW CARTONS, SEALING EACH CARTON WITH A STRIP OF **PERMACEL'S** COMPANION PRODUCT, ½-INCH TRANSPARENT **TEXCEL TAPE.**



FURNITURE MAKERS CREATE FLEXIBLE WOODEN SLIDING DOORS FOR RADIO CABINETS, ETC., BY CEMENTING HALF-ROUND DOWELS SIDE-BY-SIDE ON TO **PERMACEL-67** BLACK CLOTH TAPE.

WASHING MACHINE MANUFACTURERS AND OTHERS FIND **PERMACEL-71** PAPER MASKING TAPE MADE TO ORDER FOR MASKING PARTS NOT TO BE ENAMELED.



FREE IDEA BOOK!

COMPLETE GUIDE TO THE MANY TYPES AND USES OF **PERMACEL TAPES**—FULL OF NEW IDEAS, SUGGESTIONS THAT MAY SAVE TIME AND MONEY IN YOUR BUSINESS! WRITE FOR "FACT BOOK ON PRESSURE-SENSITIVE ADHESIVE TAPES" TO DEPT. FM-11, INDUSTRIAL TAPE CORP., NEW BRUNSWICK, N.J.

Permacel INDUSTRIAL TAPES

"PERMACEL" REG. U. S. PAT. OFF.

INDUSTRIAL TAPE CORPORATION • NEW BRUNSWICK, N.J.

mist's approach to these problems. Intended as a text, it endeavors to present basic principles for use in elementary courses.

WORKBOOK IN MECHANICAL DRAWING

S. L. COOVER, Director, Industrial Arts Department, State Teachers College, California, Pa. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 201 pages. Sketches, diagrams, charts, graphs, formulas, sample forms, lists of symbols and visual aids. $1.48.

Subtitled "An Introductory Course." This teaching manual presents specific problems together with instruction required in learning to solve them. Some of the chapter headings are "Blueprint Reading and Practical Drawing Problems," "Sketching," "Home Planning," "Dimensioning," "Special Shop Projects," and "Charts and Graphs."

BOOKLETS

A READING LIST ON BUSINESS ADMINISTRATION. 5th revision, June 1, 1947. The Amos Tuck School of Business Administration, Dartmouth College, Hanover, N. H. 59 pages. Index. 50¢.

WORK-TIME DISTRIBUTION. Time Study Analysis of Performance Differences. Martin Wiberg. McClure, Hadden and Ortman, Inc., 75 E. Wacker Drive, Chicago 1. 30 pages. Charts, appendix. No charge for single copies.

REPORT ON APPRENTICE TRAINING PROGRAM OF THE TENNESSEE VALLEY AUTHORITY. July, 1947. Apprentice-Training Service, U. S. Dept. of Labor, Washington 25, D. C. 67 pages. Exhibits A through R. No charge.

BUSINESS ORGANIZATION. Edition of 1947. Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York 10. 52 pages. Appendixes I, II, chart. Available without charge to executives requesting them on business stationery.

ENGINEERING DATA BOOK — PIPE COILS, FIN COILS. Arthur G. Vogel, A.S.R.E., W.S.E. Rempe Co., 340 N. Sacramento Blvd., Chicago 12. 34 pages. Photographs, sketches, diagrams, tables, formulas. $1.50.

THE HAND BOOK OF STEEL JOIST CONSTRUCTION. Specifications, Loading Tables, and Properties, 1946 edition. Steel Joist Institute, 3709 24th St., N. E., Washington 18, D. C. 16 pages. Sketches, tables. Single copies on request.

STEEL JOIST CONSTRUCTION. American Standard Building Requirements. Approved May 29, 1947. American Standards Association, 70 East 45th St., New York 17. 7 pages. 35¢.

JOB EVALUATION. A Study Based Upon a University of Wisconsin Industrial Management Institute Conducted In Co-

Pangborn Dust Control Costs Less than Tolerating the Dust Hog

THE little it costs to get rid of dust is minor compared to the harm a Dust Hog does. Savings in lighting, repainting, maintenance — increased production — better quality—better morale—quickly pay the cost of mechanical dust control.

Sometimes the costly "dust pockets" are unsuspected, unseen! Let Pangborn dust control engineers make a "Dust Pocket Survey" — at no charge. Write Pangborn — *world's largest manufacturer of dust control and blast cleaning equipment*. Request Bulletin 909A, too — discusses the economics of dust control and features of Pangborn systems and collectors. Address Pangborn Corporation, 282 Pangborn Boulevard, Hagerstown, Maryland.

Pangborn

DUST CONTROL

PANGBORN CORPORATION HAGERSTOWN, MARYLAND

TURNS DUST LOSSES INTO PROFITS